Apple Wordstar Lighting

Computing NOW!

Canada's Personal Computing Magazine

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November 1984

IBM PC Supplement

Putting Charlie to Work

- PC Compatible Survey
- DOS 2.0 Explained
- PC Talking Blues
- Computer Buyers and the Law
- CP/M Disk Troll

Programming dBase

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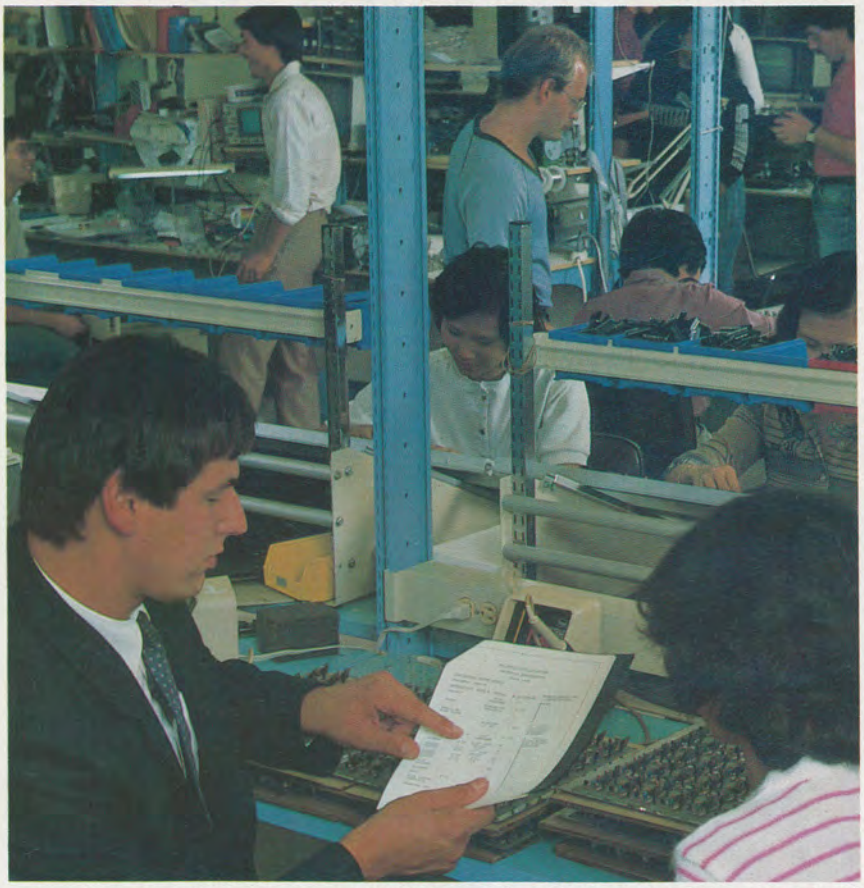
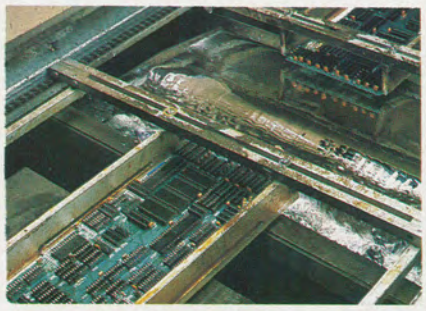


Eugen Hutka still takes an active interest in all aspects of the company's business and is seen here inspecting products on the production line.

The display signs used through the Toronto subway system are products developed and produced by Multiflex and Versa-Digital.

The Hamilton branch of Exceltronix opened in 1984. There is also a similar sized stored in Ottawa.



Almost all products are flow soldered and ultrasonically cleaned in Multiflex's 5,000 square feet production facilities.

Almost $1 million was spent last year by the group on research and development of new products.

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From a retail store specializing in electronic parts, **Exceltronix** is now only one of a group of companies, all controlled by Eugen Hutka.

Activities range from original research and development (almost $1 million was devoted solely to this last year), to manufacturing, to retailing and mail order.

Multiflex Inventions and Technologies Inc. are major suppliers to Canadian industry the advanced message display signs in the Toronto Subway system were designed by Multiflex and manufactured by Versa Digital Inc. and similar systems are in use with VIA Rail. Multiflex and associated companies do custom design, development and manufacture for all types of customers, including Northern Telecom, CGE and Bombardier.

Despite its phenomenal growth, Exceltronix has not forgotten what led to this success: personal service, and competitive prices. The same company who are mass producing IBM and Apple compatible peripheral cards will still sell you a single resistor if that is what you want.

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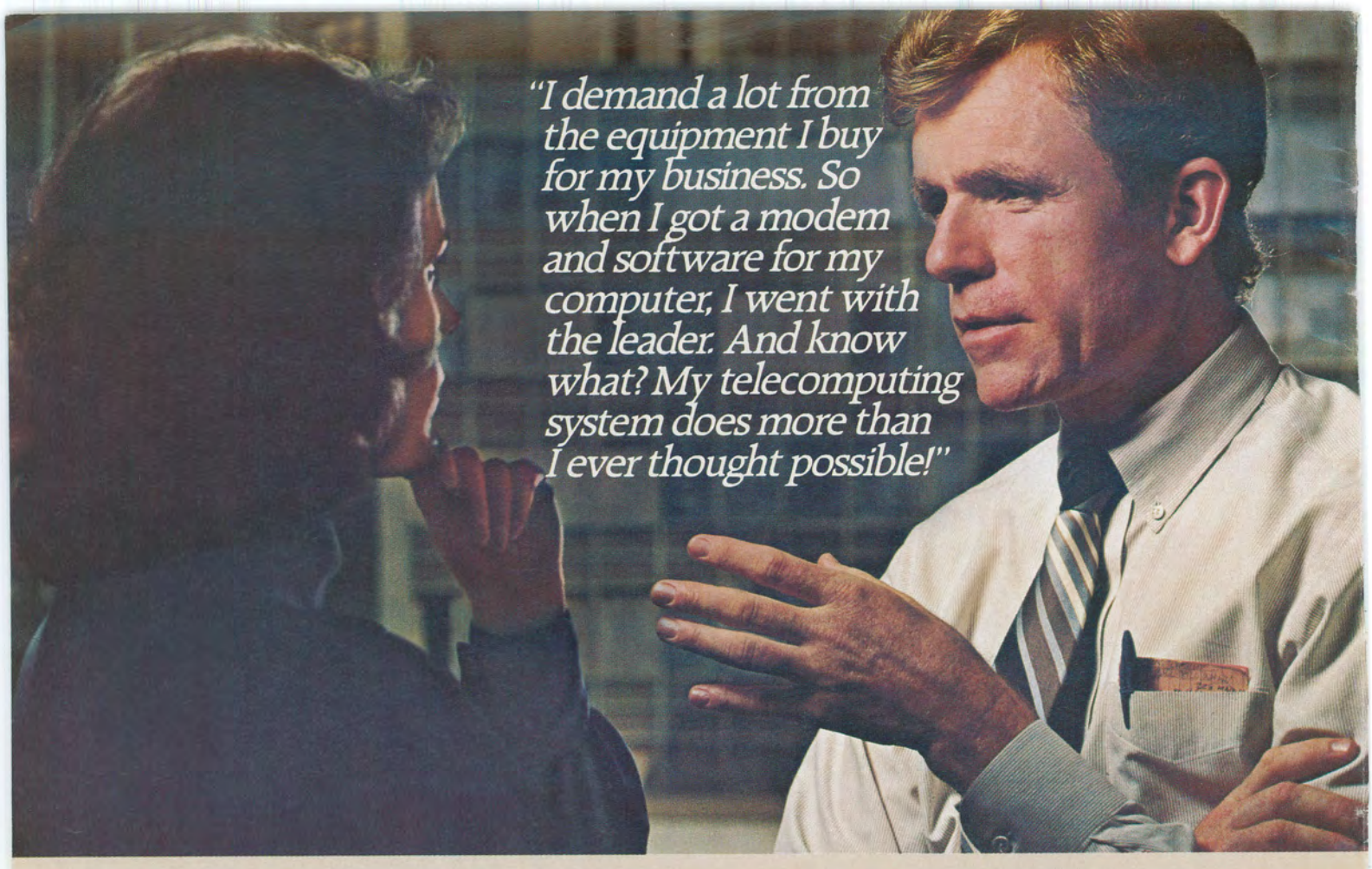

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Circle No. 10 on Reader Service Card

Computing Now!

Canada's Personal Computing Magazine

Vol. 2 No. 8
November 1984

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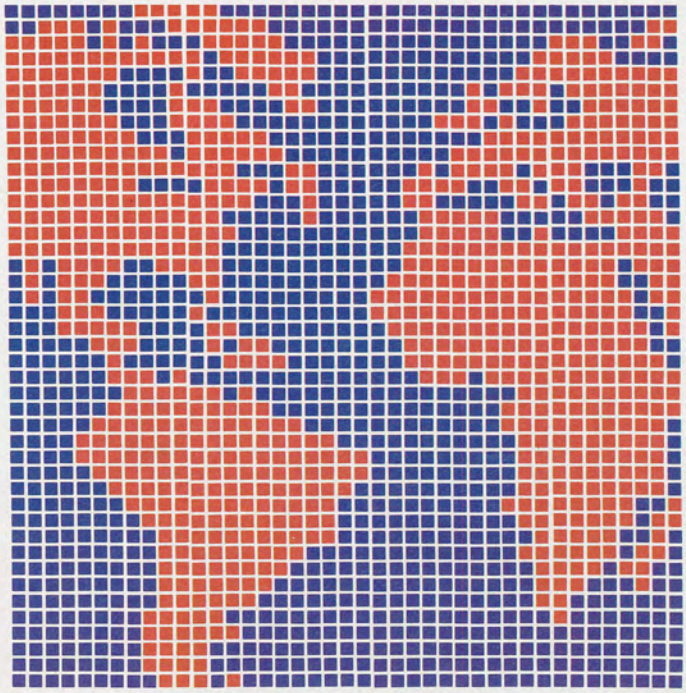

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COMPUTER PRESS

Fat Mac Is Here

TORONTO, ONTARIO — The long awaited **512K** version of the Apple Macintosh — nicknamed the 'Fat Mac' by eager American press — has been introduced to the Canadian marketplace four months ahead of schedule.

128K Macintosh users wishing to upgrade can do so by visiting authorized Apple dealers and service centres. As Macintosh RAM is soldered to its PC board, it'll be necessary for users to bring their computers with them when upgrading.

The 512K Macintosh is retailing for $4,795. The Canadian retail price for the 128K version has been reduced to $3,295. Both computers still include free copies of MacPaint and MacDraw.

Dead Computers

The **Grateful Dead** has added another instrument to their ensemble — a portable computer. The veteran rock and roll band travels an average of 200 days a year, spending much of their time on planes and buses and in hotel rooms.

Bassist Phil Lesh and drummer Mickey Hart are currently using *The Portable*, Hewlett-Packard's nine-pound computer, to communicate with their home base, as well as to take notes and compose lyrics. Hart is writing a book about the history of percussion in conjunction with two other researchers and also uses the computer to manage the huge database they've collected on the topic.

"Our ears are better educated, so we want to achieve cleaner, purer sounds," says Hart. "Sound, like water, moves in waves. The computer lets you specify and shape a sound wave, so theoretically you can create any sound in your imagination. Once we've developed the programs for it, The Portable will be another instrument in our orchestra."

One of the many ways the musicians can use the computer is to control the signal modifying equipment — such as reverberation units, filters and pitch transposers — that is now as much a part of music-making as the instruments themselves.

The longer they work with computers, the more uses The Grateful Dead are finding for them. "Not only are we learning how to use computers to make better music," says Lesh, "we're also learning how to use them to design better instruments and speakers. With a little creativity, you can accomplish a lot with a computer."

NABU Woes

OTTAWA, ONTARIO — John B. Kelly, Chairman and Chief Executive Officer of the **NABU Network Corporation** announced on September 18th that its current funding arrangements would only permit continued operations at their present level *for the next two months.*

The corporation, which has received financial support from shareholder advances, had been notified that the advances would no longer be available past November 13, 1984. Consequently, most of the corporation's staff has been given formal notice of employment termination effective November 13.

New Dimensions

COMPUTING NOW! — Coverage of Micro Craft Corporation's **Dimension 68000** computer in August 1984's Computing Now! stirred up a lot of reader interest. Unfortunately, the listed Canadian distributor, *Popular Electronic Products*, seems to be no longer in business.

Enquiries regarding the Dimension and its emulation capabilities can be addressed to its manufacturer, Micro Craft Corporation, at 4747 Irving Boulevard, Suite 241, Dallas, Texas 75247 (214) 630-2562.

Kaypro Distributor

COMPUTING NOW! — An error crept into a correction in October's Computer Press.

To set the record straight, the sole distributors (as opposed to retailers) for Kaypro computers in Canada is **Computron,** 17507-107 Avenue, Edmonton, Alberta T5S 1E5 (403) 489-8400 (Head Office) and in Toronto, 55 Torbay Road, Unit 2, Markham, Ontario L3R 1G7 (416) 477-0828.

Continued on page 85

Next Month In Computing Now!

Computer Music

The December issue of Computing Now! will feature a special focus on computer music. Not that long ago this area was limited to playing really bad renditions of Bach through a two inch speaker with the slamming of printer pins for rhythm. It's gotten a lot better . . . computer sound can rival that of any of a number of superb instruments played by accomplished musicians. The new hardware that has come of age to take computer sound out of the basement is monumental in its scope.

The December issue will feature a look at the MIDI interface and how it has changed the nature of computer sound. We'll be surveying the available music hardware and software and looking at the possibilities for computer sound even if you don't have unlimited amounts of cash.

You can still sing even if you don't get a government grant.

Programming the Mac

The Macintosh is designed as an end user's machine, but programming languages do exist. Unfortunately, they're a bit tricky to work with because the Mac itself is a bit of a mystical experience within. There are calls to handle things you probably never knew needed handling at all, ROM trolls to deal with and graphics that don't quit. Next month we'll be looking at some applications for all this power.

Ten Great Ways To Fry A Floppy Disk

Perhaps the most universally accepted medium since the research and development project for writing paper finally bore fruit, the floppy disk is flexible, powerful and, unless you're careful, volitile as anything can be without actually disintegrating when you look at it. The December issue will feature a host of great ways to shorten the life of a floppy . . . or, if you would rather have them last a while, ten splendid disasters waiting to happen and the information you need to keep 'em that way.

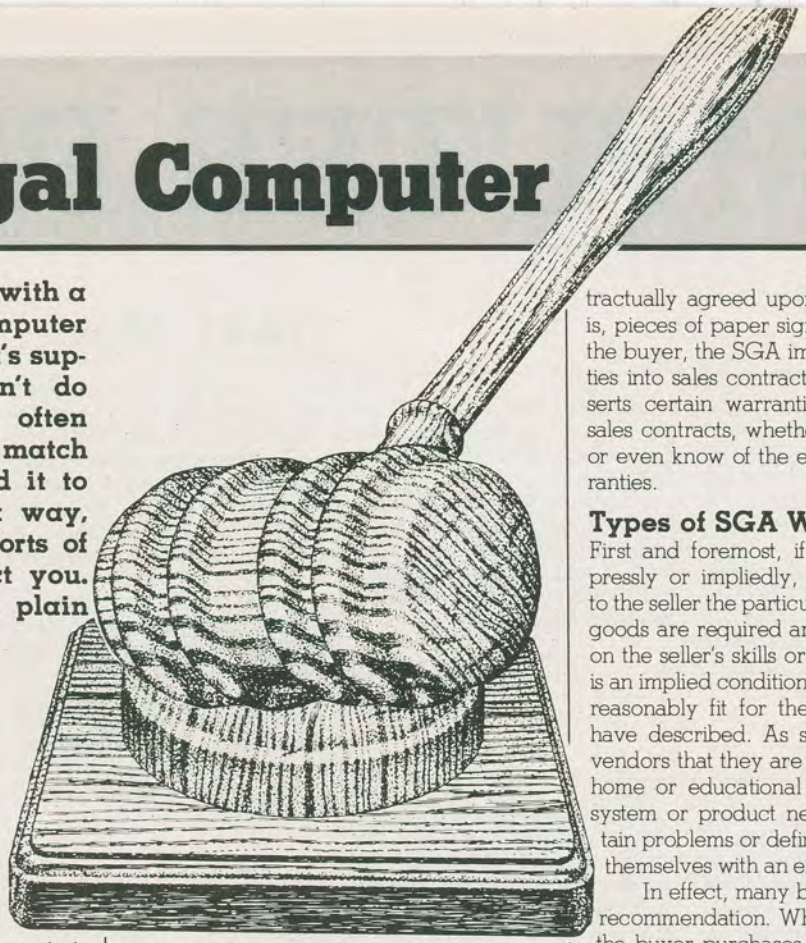
A Time For PC's

The IBM PC has, amongst many other features, a system clock which maintains the time and keeps things cooking along. It can be very useful . . . but it's usually a bit of a cow to apply. Next month we'll investigate the software needed to make use of the clock, and keep the time from getting the better of you.

The Legal Computer

Unless you are a demon with a soldering iron, a computer which doesn't do what it's supposed to do... or doesn't do anything at all... can often mean a long shouting match with the party that sold it to you. It needn't be that way, though... there are all sorts of complex laws to protect you. Here's how it goes, in plain English.

by David H. Latner



[The author of this feature is a lawyer with the Toronto law firm of Seon, Gutstadt and Associates, specializing in computer law. –ed]

The wide range of microcomputer hardware and software products available makes choosing any particular component or system difficult. In deciding, you may do research yourself, obtaining and relying upon technical and price data from dealers, advertisements, package descriptions and/or demonstrations. The area which most potential purchasers find difficult to research, however, concerns the rights they have if they buy a system, begin using it at home or work and discover it is defective or does not live up to the supplier's claims.

The explosive growth in the sale of computers has spawned many lawsuits dealing with the quality and suitability of computer products. Your legal rights, as an acquiror, depend on the strength of the contract, and specifically the warranty, you receive from the supplier. The basic principle involved is that a vendor will be legally liable if it fails to supply the system or component promised.

However, various statutes, hundreds of cases and the unique technology and market structure of the computer industry, have greatly complicated this principle. This article generally surveys an acquiror's rights when the computer component or system purchased do not work as promised. In depth analysis is impossible in a brief article. For specific problems, consult a computer lawyer.

The Sale of Goods Act

The foundation of commercial law dealing with sales and warranties is the *Sale of Goods* Act, or SGA. In this article reference is to the Ontario SGA. However, excepting Quebec, each province has very similar legislation.

Deciding whether the SGA covers your particular acquisition is important in determining your rights. The Act governs the sale of goods. Leases of goods, or sales of services, such as maintenance contracts, are not, strictly speaking, within the Act, although it may arguably apply by analogy.

Sales of hardware are clearly governed by the SGA. Canadian case law also indicates that either packaged or custom software, where purchased with hardware, will constitute goods. In these cases the purchaser can obtain the protection of the Act.

No Canadian case has definitively decided that either packaged or custom software standing alone is a good. Furthermore, much software is, technically, licensed, rather than sold. Strong legal and public policy arguments can be marshalled in favour of extending SGA protection to acquirors in both instances, but the issue is still open.

The sale of hardware and/or software will usually obtain the warranty protection of the SGA. A warranty is basically a promise or guarantee of a product's integrity and of the maker's or supplier's responsibility for the repair or replacement of defective units.

Apart from any express warranties contractually agreed upon by the parties, that is, pieces of paper signed by the seller and the buyer, the SGA implies various warranties into sales contracts. That is, the law inserts certain warranties by suppliers into sales contracts, whether or not they agree, or even know of the existence of such warranties.

Types of SGA Warranties

First and foremost, if you, the buyer, expressly or impliedly, clearly communicate to the seller the particular purpose for which goods are required and show that you rely on the seller's skills or judgment, then there is an implied condition that the goods will be reasonably fit for the purpose which you have described. As such, buyers who tell vendors that they are in a specific business, home or educational situation and want a system or product necessary to solve certain problems or defined tasks are providing themselves with an extra layer of protection.

In effect, many buyers ask for a vendor recommendation. When this is the case and the buyer purchases something in reliance upon such recommendation, a court would likely find the warranty of fitness for purpose applies. If so, the seller is strictly liable for defects. That is, it will not help the vendor to prove it did everything reasonably possible to prevent a defect or even that the defect was undiscoverable in advance.

Another important implied warranty exists. Where goods are sold by description, such as through a catalogue, there is an implied warranty that they will be of merchantable quality. Merchantable quality means the goods must be useful for their normal purpose, or for any special purpose communicated by the buyer to the seller.

This warranty will be increasingly important as more sophisticated users make their own acquisition decisions in reliance upon catalogue descriptions and advertisements, and acquire products through the mail. However, it may be difficult to apply in an pioneer industry. For example, the software industry is very young with fluid standards. It is hard to say what a particular program must contain to be deemed merchantable. If it contains many bugs and is non–functional the answer is clear. If it largely works but has a few bugs or lacks some features that you believe a professional designer should have included, proving non–merchantability will be problematic.

The SGA provides two basic remedies for buyers when sellers breach their warranty obligations. These are rescission of the contract and damages.

Until the purchased goods have been

accepted, the buyer can rescind the contract if there is a breach of warranty. After the goods have been accepted, the buyer cannot rescind the contract and return the product in exchange for payments made. However, the buyer could sue for damages. The award will provide compensation for damage but will rarely impose punitive awards against the vendor.

It is clearly vital to ascertain when or whether goods have been accepted. Several Canadian cases indicate that, absent of any contractual clauses to the contrary, a buyer of computer technology has a "reasonable" length of time to test and evaluate the system to determine whether it complies with his needs as described to the vendor. Therefore, some vendors commonly include contract clauses deeming buyer acceptance at a set date. In these instances the buyer is limited to suing for damages.

Warranty law tries to balance the customer's need for protection against defective or inappropriate products and the vendor's need for protection against unlimited damages. An unknown bug in a system could result in hundreds of claims for rescission or damages. The sums involved could be huge if the bug led to large losses for the users.

The SGA permits contracting parties to vary or exclude its provisions. Therefore, manufacturers and vendors routinely insert disclaimer clauses into contracts. These state that no implied or express warranties apply, except for any set out in the contract. Needless to say, any warranties granted in these cases are narrow.

A paraphrase of the standard clause would read as follows. "The manufacturer/supplier warrants the product will conform to the manual's specifications. We do not warrant that it meets the standards indicated in our advertising or sales pitches, or that it is generally merchantable or fit for any particular purpose."

Furthermore, the vendor can also limit remedies. A rough paraphrase might be: "If the product does not even meet the limited warranty granted, your sole remedy will be to have the supplier repair or replace the defective part. If you sue, you can sue for no more than the price of the component or system involved." Thus, if your five thousand dollar system crashes and you lose a hundred thousand dollar client, you can only sue for five thousand dollars.

Is There Any Protection?

Economically and technologically, most computer manufacturers and many sellers are stronger and more sophisticated than their customers. Therefore, they can often dictate one-sided contractual terms. Of course, they may not strictly enforce their legal rights. Reputable sellers seek a long term relationship with buyers, and will often go to great lengths to remedy defects to satisfy customers.

As consumer knowledge and market competition increase, retailers are less likely to wave a self-serving warranty at a potential customer. Even Computerland in Canada merely uses a sales invoice rather than a full contract. Therefore the SGA often provides a tool for relief against the seller, though the manufacturer has shielded itself.

Even if clear clauses exist in a contract limiting vendor and manufacturer liabilities and buyer remedies, purchasers may still obtain relief. If the breach of performance by the supplier is fundamental, that is, if the system or component is a true lemon and fails to fulfill its essential purpose, then the acquiror will generally be entitled to rescind the contract. If a fundamental breach of contract has occurred, even a well drafted disclaimer clause will not likely protect the supplier.

Furthermore, courts may hold that pre-contractual brochures, advertising, bids and sales pitches constitute "collateral" or parallel, agreements binding the supplier. This is particularly so when weak purchasers are left remediless by harsh disclaimer clauses.

Hardware manufacturers and software creators commonly produce brochures and advertising with representations as to the capabilities of their products. Acquirors often purchase these products in reliance on such information. In similar circumstances involving complex machinery, such representations have been considered collateral warranties. If the representations turn out to be *mis*representations, the vendor as well as the manufacturer may be liable to the acquiror.

This is important in Canada, where many computer products sold are made by foreign manufacturers who may be difficult to sue. Consider spending five thousand dollars to to sue a manufacturer in Japan for a defective thousand dollar printer.

The applicability of collateral warranty reasoning is uncertain. Courts use it mainly

The Legal Computer

when faced with situations of gross injustice and unequal bargaining power. With a computer acquisition in a competitive market by a business person for business, or mixed, uses, the justification for judicial intervention decreases. This is particularly so if the buyer has independent computer advice, or is a second time acquiror.

Consumer Protection

The protection of consumers' interests is becoming stronger. In addition to the generally available legal protection available for computer acquirors, special protection exists for consumer acquirors. Most provinces have statutes similar to Ontario's Business Practices Act, or BPA and Consumer Protection Act, CPA, which govern consumer transactions.

The BPA deems to be unfair false, misleading or deceptive consumer representations and unconscionable consumer representations. This latter includes transactions so one-sided against the consumer as to be inequitable. An agreement entered into by a consumer induced by a representation that is an unfair practice may be rescinded and may result in damages being imposed in order to compensate the consumer.

Under this statute unconscionable representations may result in punitive as well as compensatory damages. Both the actual maker of the statement and the supplier corporation will be liable for damages. Thus the vendor could not escape liability merely because the particular salesperson is no longer with the company. This is important due to the high turnover of sales staff in a microcomputer environment.

The Consumer Protection Act requires written contracts for acquisitions involving more than fifty dollars where delivery and/or payment will be completed after the contract is entered. This encompasses most computer system acquisitions. The Act requires that if no warranties are granted, the contract must specifically state this.

This being the case, the vendor probably could not merely issue a bill of sale and deliver a system and rely on a sign on the cash register excluding the implied Sale of Goods Act warranties.

Both the BPA and CPA apply to acquisitions of goods and services by individuals for non-business uses. Neither can be waived or excluded. As such, their scope is much broader in two respects than that of the SGA. Services are covered as well as goods and the statutory protection involved cannot be disclaimed or excluded, as can SGA warranties. However, the Acts are narrower than the SGA insofar as they only cover acquisitions by individuals, as opposed to those by corporations or partnerships, and only if the acquisition is for non-business uses. Their scope is thus restricted largely to the home, and possibly educational, computer markets.

Taking Action

Consider that you have acquired a system and discover it has a bug which can't be cured, or that it does not meet your needs as you described them to the vendor. You may wonder what can be done.

To begin with, take the product back to the dealer. Computer industry competition is fierce. Most manufacturers and retailers are aware of the need to provide fair return and service policies to customers. Reputable dealers often will accept a return or exchange in order to build up goodwill and a long term relationship with satisfied customers.

Your problems are generally with disreputable dealers, however. If you are reading this article with a particular problem in mind you will undoubtedly have tried this first, and most reasonable, approach.

If you cannot resolve your problem alone, consider enlisting public pressure. Many newspapers have consumer oriented columns. These probe complaints and often persuade vendors to treat customers more fairly.

More specifically, the Canadian Computer Dealer Association may provide some help. This commendable non-profit organization has various worthwhile goals. One is the development and implementation of a code of ethics among its members. Purchasing your computer from a dealer with CCDA or Better Business Bureau membership indicates that a certain level of ethics will exist, or that pressure can be brought to

bear the dealer should it turn out not to. Even if the particular dealer is not a CCDA or BBB member, these respected watchdogs are influential and may persuade the vendor to act more fairly.

If all else fails, you can exercise your legal rights under the SGA and other consumer protection statutes which provide warranties and help battle misleading advertising and other unfair trade practices.

If the product is inexpensive or the damage light, you may believe it will not be worth the time, cost and aggravation involved to sue. However, in these situations the existence of small claims courts provide ideal opportunities to obtain justice. The proceedings involved are relatively informal. Lawyers need not be involved; you can limit their input to providing you with the legal arguments in advance, so you can go into court yourself and, hopefully, win. The cost of such and undertaking is thus fairly small.

Furthermore, small claims court judges tend to decide cases based on the justice of a particular situation, rather than upon strict, literal interpretation of the law.

If your claim involves the Business Practices Act you may, in certain circumstances, you can register a complaint with the appropriate government consumer protection agency. Your case may merely be one of many filed against a generally abusive or deceptive practice by the vendor. In such situations, the government agency may be able and willing to bring a quasi-criminal action on behalf of the public interest to bar the offending practices, and possibly fine the perpetrator.

If large sums are involved a higher court case, including lawyers, may be necessary. However, potential litigants can derive solace from the fact that most cases are settled before trial. In these cases the mere threat of a trial, with its attendant costs and bad publicity, is a bargaining chip which usually obtains results for truly victimized acquirors. Don't throw the leverage away by deciding in advance to suffer in silence rather than sue.

An Ounce of Prevention

While the Sale of Goods Act clearly applies to the purchase of most computer products, experience indicates that, where possible, SGA implied warranties are usually disclaimed by manufacturers and some retailers in written contracts. Furthermore, the SGA may not provide protection in for the sale of services, such as maintenance, training, and so forth, or for leases or licenses, as opposed to sales, of hardware and software.

As such, acquirors must closely analyze contractual warranties. Fortunately, as market competitiveness and acquiror sophistication increase, some manufacturers are offering more easily understood and broader warranties.

Furthermore, today's competition means you have scope to negotiate. Unless you are a large corporation you probably will have no luck with the manufacturer, but you can squeeze the vendor for a fairer deal. Expand your sales invoice into a true contract, including effective warranties and remedies. Specify your needs and state that you are relying on the vendor's representations, which should be appended to the contract.

Warranties are your insurance. Don't trade them away in order to obtain a slightly cheaper deal.

Aim for a lucid, comprehensive contract defining the transaction's scope and terms, and each party's rights and duties. The contract signifies that the parties have reached a binding agreement, with appropriate remedies for breaches.

To reduce the possibility of misconceptions and disappointments, ensure that the contract crystallizes the mutual understanding of the parties. Detailed specifications and pre-acceptance testing are very helpful. They protect each side against the unreasonable expectations of the other, and provide a clear test of performance.

Buyers have lost law suits for allegedly defective computer systems because the specifications promised were met, or were too vague for a court to ascertain what performance level was promised. A well drawn contract, clearly allocating risks and responsibilities, will reduce the likelihood of litigation and increase your chances of victory should litigation occur. **CN!**

Replicate in VisiCalc

Just getting into the dripping catacombs of VisiCalc, are you... some of the nuances of the artform may still be escaping you. Here's a look at one which, aside from being clever, will also save you a lot of typing.

by Kevin Fraser

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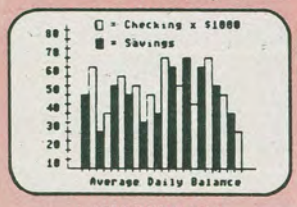

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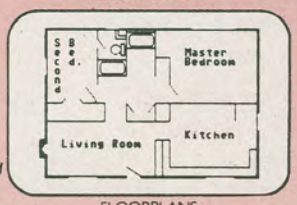

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Replicate in VisiCalc

If you've ever gone out and bought one or more of those spreadsheet books that have vast assortments of really useful spreadsheet templates in them, you may, upon opening the book have remarked to yourself, "Gee, this looks a lot like Martian hieroglyphics."

Or words to that effect.

This article will outline a few techniques for dealing with the construction of spreadsheets that are much closer to the way the human mind likes to work. With a little understanding of the few principles governing the operation of the replicate command in *VisiCalc*, you can be slapping together those turkeys in the spreadsheet books a lot faster and understanding more clearly how they work to boot.

Speaking of boot...

Getting Started

To begin with, fire up *VisiCalc*, prop up the magazine near the screen, crack your knuckles and look at figures one and two.

These are each representations of the exact same spreadsheet. If you're anything like me, you'd rather deal with figure two any day of the week. Figure one is obviously the work of the aforementioned Martian scribe.

In this article we're going to do a little spreadsheet construction. The replicate command, when properly applied, can go a long way toward making the whole process seem like a kind of construction.

Even if you've never touched *VisiCalc* before, you'll be able to do the things in this article just by following the directions. To begin with, let's have a quick scan of the replicate command itself.

A cell is any unit of information that you can put the cursor on. The cursor, of course, is the mobile inverse bit on the screen. Move the cursor to cell A3. The screen should say A3 in the upper left corner. This upper left hand corner always shows the coordinate of the cell you're on.

We'll start with something simple. Type

```
/--
```

and hit ENTER. This should fill the cell with dashes.

The replicate command in *VisiCalc* is called up by typing */R*. Do so. Whenever you call up the replicate command, think of it as plugging in a copying machine. Pandora's box opens for business, and it's time to get more specific.

At this point, *VisiCalc* wants to know the source range. Don't be put off by these terms if you don't understand them at first.

```
>E11:/F$@SUM(E4...E9)
>D11:/F$@SUM(D4...D9)
>C11:/F$@SUM(C4...C9)
>E10:/-=
>D10:/-=
>C10:/-=
>E9:/F$1.1*E8
>D9:/F$1.1*D8
>C9:/F$1.1*C8
>A9:1+A8
>E8:/F$1.1*E7
>D8:/F$1.1*D7
>C8:/F$1.1*C7
>A8:1+A7
>E7:/F$1.1*E6
>D7:/F$1.1*D6
>C7:/F$1.1*C6
>A7:1+A6
>E6:/F$1.1*E5
>D6:/F$1.1*D5
>C6:/F$1.1*C5
>A6:1+A5
>E5:/F$1.1*E4
>D5:/F$1.1*D4
>C5:/F$1.1*C4
>A5:1+A4
>E4:/F$67.5
>D4:/F$384
>C4:/F$120
>A4:1
>F3:/--
>E3:/--
>D3:/--
>C3:/--
>B3:/--
>A3:/--
>E2:1+D2
>D2:1+C2
>C2:1
>A2:/FR"MONTH
>E1:/FR"PRODUCT
>D1:/FR"PRODUCT
>C1:/FR"PRODUCT
>B1:"CAST
>A1:"SALES FOR
/W1
/GOR
/GRA
/GC9
/X>A1:>C4:
```

Remember you are just copying stuff *from* one area on the spreadsheet *to* another area.

The source range is just the cell or cells you wish to clone. Since we only want to copy one cell right now, just press enter. This will give us a source range that starts and ends with the same cell.

The system will now want to know what the target range is. This just means it wants to know where to put the copy of the source range stuff we just defined for it. All you have to do is move the cursor to show it where you want the copies to go. Since we're making a line across the sheet, we want to clone cell A3 into each of the cells from B3 to F3. Move the cursor to cell B3.

Look at the edit line near the top of the screen, and move the cursor about a little. See how it keeps track of which cell you're on. Now put it back on B3 and press the period key.

Notice how it gives you three periods and chucks the cursor back to A3, from whence all this started.

Just move the cursor along to F3 and press enter. The screen will think for a second or so, then you'll have a line of dashes from A3 to F3.

After you've done this replication business a few times and have started to get the hang of it, you will sense how powerful and time saving this command is. If you've never used this feature before, it's a revelation.

Can't Get No Replication

What you've just replicated is a label. The line of dashes you created with the — command could just as easily have been a word, a number, a formula or a whole row or column. Consider the possibilities.

You should have a line across your sheet from A3 to F3.

We're now going to proceed to construct the spreadsheet in figure two. Put the cursor on cell A2 and type the word MONTH. Then press enter and type */FR*. This will line the word up on the right edge of the cell.

Move the cursor to A1 and type SALES FOR, then move to B1 and type CAST and press enter. Now move over to C1 and type the word PRODUCT and press enter. Type /FR as with the word MONTH in cell A2. Replicate it into D1 and E1 using the technique you used to create that line across row 3. I'll wait.

Notice how when you replicate a cell, it replicates everything about that cell, including the format the data is displayed in. Both the cells you replicated will right justify the word "product" even though you only typed */FR* once, on the source cell.

Replicate in VisiCalc

```
B4                                                              C
                                                               23

  .....A.........B.........C.........D.........E.........F....
 1.SALES FORCAST          PRODUCT   PRODUCT   PRODUCT
 2.     MONTH                   1         2         3
 3.-------------------------------------------------------------
 4.          1
 5.          2
 6.          3
 7.          4
 8.          5
 9.          6
10.
11.
12.
```

Move to C2 and type a *1*. Move to D2 and type *1+*. Now move to C2 and press enter. A *2* appears in D2. With the cursor on D2, type */R* and press enter. Move the cursor to E2 and press enter. You want the formula adjusted for the new cell, so type *R* for *relative* when it asks. If all goes well you get a '3' in cell E2.

To illustrate what this formula does, move the cursor to C2, type a number and hit ENTER. You will note the numbers in D2 and E2 are always sequential and increment by one. Store that somewhere in your mind. When you're satisfied how this works, put a one in C2 and hit enter.

One from Column A

Now we are going to get rather clever. Move the cursor to A4. Type a *1* and move to A5. Now type *1+* and move the cursor to A4. Hit enter. You should get a *2* in A5. should get a *2* in A5.

Tiny errors don't produce error messages . . . they produce answers.

Call up the replicate command by typing */R*. It's only fitting you should be on a first initial basis by now.

Since you're already there, press enter to indicate that A5 is the cell to be replicated. Now, just slide the cursor down to A6, the first cell in the target range. Enter a period.

Move the cursor down to A9 and press ENTER.

Note that the cursor automatically flies back to the cell it was on when you fired up the replicate command. Store that somewhere in your mind, too.

Now answer *R* to the not relative/relative question. If you did this right, you now have the numbers one through six in column A. None from column B, side of fried rice.

Your sheet should now look something like figure three. Let's get interesting. Put the cursor on C5 and do a */F$*. Hereinafter, all data in cell C5 will be displayed in the dollars format, the favourite of money grubbers the world over.

Type *1.1**. Now move the cursor up one cell to C4 and press ENTER. You'll get *0.00* in cell C5. Now replicate C5 into C6 through C9 exactly the way you just did with column A.

You should be starting to feel like an old hand at this.

When this is done column C will be full of *0.00*. Put the cursor on C4 and enter a number to represent sales of product one during month one. You probably see a picture emerging here.

The Bottom Lines

Move down to C10 and type */—=* and hit ENTER to give you a nice double line for the bottom line. Move down one more to C11, and type *@SUM(*. Move the cursor to the top of your column of numbers, C4, and press a period. Now move the cursor to the bottom of your column, C9 and enter *)*.

Type a */F$* to give it that professional finishing touch and go to D4.

Just for the heck of it, type in some numbers in D4 and E4 to represent sales of products two and three during month one. While you're there, type */F$* into D4 and E4 as well.

Now we're going on a serious power trip.

Put the cursor on C5. Type */R* to spark up the replicate machinery. Hit a period and move the cursor all the way down to C11 and smack the ENTER key. You've just indicated a source range of C5...C11. Now it's time for the target range.

Put the cursor on D5 and hit a period. Put the cursor on E5 and hit ENTER. Answer the relativeness query with an *R*. Answer it with an *R* again. And again and again...

As you answer this mindless question, watch in mystical awe as rows of accurately calculated sales figures, increasing by a factor of ten percent each month... remember that *1.1** a while ago... careen down the columns of your monitor.

Naturally, this has been a very simplified example. One of the problems with software designed to handle massive amounts of data is that test models for them must either be trivial or take meaningful parts of a normal human lifespan to enter. However, if you've used a spreadsheet at all you will probably appreciate the power of the replicate function. It saves time, and, more to the point, assures that, given an accurate model to start with all your subsequent entries will also be accurate.

That is, after all, one of the catches of spreadsheet models. Tiny errors don't produce error messages... they produce answers. It may be quite some time before you notice that the answers happen to be wrong. **CN!**

```
C4 /F$  (V) 120                                                 R
                                                               22

  .....A.........B.........C.........D.........E.........F....
 1.SALES FORCAST          PRODUCT   PRODUCT   PRODUCT
 2.     MONTH                   1         2         3
 3.-------------------------------------------------------------
 4.          1              120.00    384.00     67.50
 5.          2              132.00    422.40     74.25
 6.          3              145.20    464.64     81.68
 7.          4              159.72    511.10     89.84
 8.          5              175.69    562.21     98.83
 9.          6              193.26    618.44    108.71
10.                       ==========================
11.                        925.87   2962.79    520.80
12.
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Educational Software

Your computer can teach the kids more than just programming. Software is available to make learning fun . . . sort of like a video game without the aliens.

by Marianne Paul

Educational computer programs tend to teach traditional subjects in traditional manners. Recently this approach has come under fire. Critics claim that educational software seldom takes advantage of the unique capabilities of the computer. Conventional teaching and learning methodologies are being applied to the new technology.

Computers are often used as a kind of electronic flashcard, a "drill and practice" machine. In such cases, programs are designed to review facts. There is a place for this type of software, but the problem arises when these programs are used to the exclusion of all others. Through graphics, colour, animation, sound effects and a bit of creativity on the part of the programmer, traditional styled software can offer more than a question and answer, or fill in the blanks approach to learning.

Consider, for example, *Math Blaster!* by Davidson and Associates (6069 Groveoak Place, #12, Rancho Palos Verdes, CA 90274). *Math Blaster!* builds and reviews basic math skills through a arcade-styled game, suitable for students in grades one through six. Arithmetic problems are still flashed across the screen but the challenge and fun of the game adds excitement to a task that might otherwise be boring.

Another imaginative example is *A Piece of Cake,* by Counterpoint Software, Incorporated, (4545 West 65th Street, Suite 218, Minneapolis, Minnesota). Instead of simply practising arithmetic, children "visit a bakery . . . a magical bakery," where they learn to add, subtract, multiply and divide . . . cakes.

It is predicted that widespread use of computers in society will prompt a radical change in our concept of intelligence. Presently, intelligence tends to be measured in terms of what we know, that is, the data we can retrieve from our memories. Much of the educational process emphasizes memory work, from preschool through to university. For example, in most situations, students write tests without use of reference book.

Educational software is considered most effective when it encourages creativity, analysis, and problem solving. *Rocky's Boots,* from The Learning Company (545 Middlefield Rd., Suite 170, Menlo Park, CA 94025) is a renowned example of such a program. Developed to teach introductory logic and circuit design, it is billed as "the content of a college course in logic, with the attraction of an arcade game." The suggested age is seven years and up.

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Educational Software

Adventure fantasy computer games are a popular breed of software that, mistakenly, are often considered purely entertainment. Many educators, however, value these games for their educational worth, using them in the classroom to promote information processing, analytic reasoning, strategic planning, problem solving and abstract thought. Skills such as spelling and reading comprehension often improve as well. Best sellers in the adventure fantasy field include software such as *Zork I, II,* and *III* by Infocom (Infocom Inc., 55 Wheeler St., Cambridge, MA 021380) and *Temple of Asphai* by Epxy (1043 Kiel Court, Sunnyvale, CA 94086).

Many of the adventure fantasy programs are complex, require experience in adventuring and computing and appeal mainly to teenagers and adults. *The Snooper Troopers,* however, by Spinnaker (Spinnaker Software Corp., 215 First St., Cambridge, MA 02142) are appropriate for beginners in this field, and are written particularly for children. The suggested age range is ten years to adult. The player attempts to unravel a mystery. In case one, the challenge is to discover who is trying to scare the Kim family out of their home. In case two it's to discover who stole Lily the Dolphin from the Tabasco Aquarium. According to Spinnaker the games "help children learn to take notes, draw maps, classify and organize information" and "develop vocabulary and reasoning skills."

Unrealities

Computer simulations are employed more and more as teaching aids. This type of software attempts to re-create situations that, for a variety of reasons, are impractical or impossible to carry out in real life.

There are many imaginative programs appearing on the market. For example, *Rendevous* (Eduware Services, Inc. Box 22222, Agoura, CA) simulates operation of the Space Shuttle. *Community Search,* by McGraw-Hill (1221 Ave. of the Americas, New York, NY 10020), re-creates the formation of civilization, presenting typical problems faced by the human race throughout time.

Another type of educational software is that which promotes computer literacy. Computer literacy still remains largely undefined; there is general agreement, however, that it involves ease and familiarity with computers. Many childrens' games accomplish this goal as a byproduct, acting as a gentle and fun introduction to computer operation. Alphabet programs, for example, not only teach letter recognition but keyboarding skills as well.

Educational Software will hold a child's interest much more so than educational texbooks.

Many experts think that computer literacy also involves a working knowledge of such areas as word processing and computer programming. Often, these skills are taught in depth at the secondary, or college level. There is software, however, specially designed to teach such skills to young users. Turtle Graphics is a feature of Logo, a computer language written for children as a simple introduction to programming. The operator controls a simulated "turtle," using it as a type of pen to create geometric shapes.

A highly-respected word processing package for children is *Bank Street Writer.* The home version is manufactured by Broderdund Software (1938 Fourth St., San Rafael, CA 94901) and the school version by Scholastic Incorporated (730 Broadway, New York, NY 10003).

Word processing releases the young author from mundane tasks. Poor penmanship, spelling mistakes or an omitted sentence no longer needs to result in the boring job of re-copying entire pages. Concentration is rightfully focused on the creative process.

Evaluation

The first step in evaluating educational software, is deciding whether a program fits your needs. What do you want the software to do, and how do you want it done? For example, is the purpose of the program to help your eight year old memorize his multiplication tables, or some other facts? If so, drill and practice software will do the trick.

Do you want to teach yourself typing? Perhaps a self paced tutorial would best suit your style. Do you want to acquaint your preschooler with your new computer? A simple game, with the emphasis on fun, and ease of operation, should suffice. Do you want to stimulate your child's creativity? The electronic flashcard isn't going to do that; you might better consider a program that offers more flexibility, that invites the operator's input. How about Spinnaker's Story Machine? The user writes his own story, and watches it "come alive" on the monitor.

Or perhaps you would like to introduce your child to the basic concepts of computer programming and procedural thinking. You might try Delta Drawing by Spinnaker, designed to teach the operator to program the computer to draw and colour pictures. May be your child is a budding music buff. Yes, you can even find a computer program to learn and practise the scales. Check out *Early Games Music For Children* by Counterpoint Software.

There are now sufficient software authors and manufacturers to allow a parent to set high standards in choosing the best program for his or her child. It may take research; a trip to the local computer store will not necessarily provide the information needed to make an appropriate selection. Software titles are constantly changing. Store lists may be outdated, or deal solely with one software manufacturer. It is beneficial to keep an eye on computer magazines, reading the reviews and searching through the advertisements. It is also worthwhile to write manufacturers directly. They are usually more than pleased to send brochures outlining their latest products.

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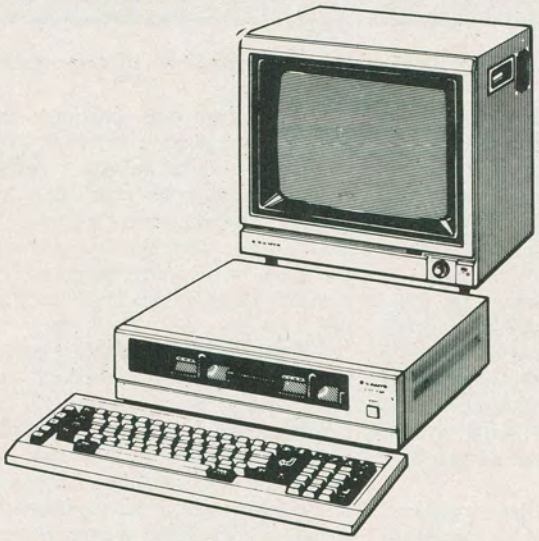

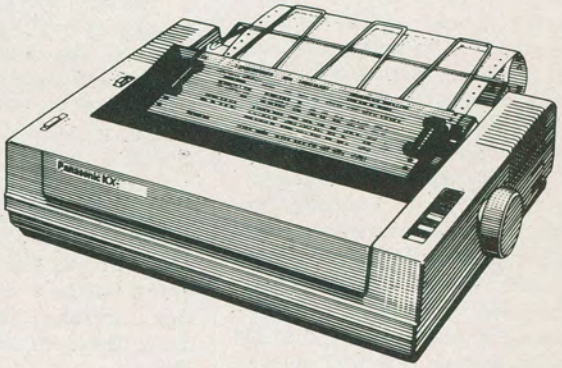

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Educational Software

Buyer's Checklist

The most effective way to evaluate whether software meets your needs and standards is to run the program. Ideally, prospective shoppers can test software in the store before making a purchase. There are a number of factors to consider.

First, is the program easy to operate?

This is extremely important if the intended user is young or a novice to computing. Software has little educational value if the operator cannot use it; in spite of the worthiness of its lessons. The child should be able to easily maneuver back and forth throughout the program with little or no assistance. If he can't, the software may have been written for an older user. Check the age range suggested in the documentation, or on the software package. Difficulties, however, may be an indication that the programmer has been sloppy, not taking care to design the software to suit the special needs of his prospective audience.

Young children, for example, have limited reading skills. Important considerations for this group are whether the operation is dependent upon the written word. Whether is it necessary to type entire word, whether operation requires a series of key stokes. Programs beginning with questions such as "Do you want colour?", "How many players?" "What is your name". This will frustrate the young operator before he reaches the actual lesson. Imaginative programmers have surmounted such problems; one effective approach has been to construct menus of pictures instead of vocabulary.

The young operator should never be "abandoned." At every stage his or her options should be available on the screen. Similarly, the program should be so well designed that the child can successfully run it without reading the documentation first. Like many adults, the young user is excited about the prospect of a brand new piece of software. he loads it plays with it and then, perhaps, has a look at the manual.

As a final consideration, is the program "child-proof?"

You should make mistakes while testing software. Press the spacebar when the instructions call for Return, or Escape. Push two keys at once, or even three. After all, the inquisitive child may push five, or six . . . just to see what happens. Does the program die? If so, apologize to the store owner and buy another piece of software. The original would never survive normal use by a normal child.

Child Appeal

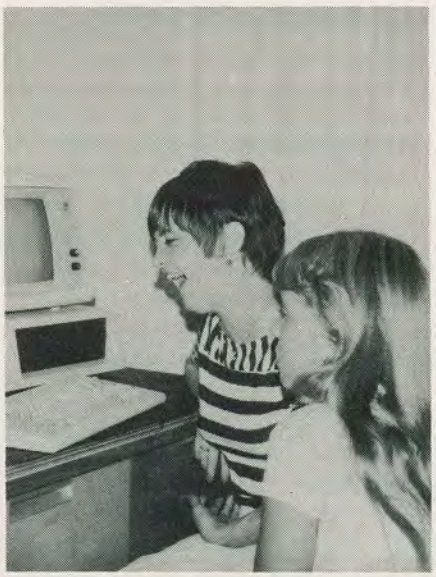
Children love to play. Effective educational software uses play as a learning device. It incorporates fun into the lesson. The child returns to the program over and over again, because it is enjoyable.

Games captivate the imagination of the young user and take a variety of forms via computer. The creative programmer magically transforms the dullest exercise into an exciting, action-packed activity. With the right software, a child will beg to turn off the television set, in order to practise . . . arithmetic.

Software should be visually, and auditorialy, pleasing. Things should *happen*. Graphics are more fun to look at than a screen filled with print. Animation is more appealing than a stationary object. Bright colours are more stimulating than black and white and sound effects are more enjoyed by kids than silence.

The unique advantage of the computer as an instrument of learning is that it is interactive. Unlike other media, such as a textbook or television set, the computer demands participation. A chain reaction is induced: the operator enters data and the computer responds, promting the operator to answer the computer and the computer to answer back. Interactively, the machine and user progress further and further into the intricacies of the program and in the case of educational software, into the learning lesson.

In the most effective educational software, the computer's response is tailored to meet the specific needs of the student. A number of avenues are possible, the direction of the program is dependent upon the user's input. A different child, entering different data, would proceed along a different path. Choices and selections are an integral part of software that promotes creativity, decision-making and logic.



Think about these important considerations in evaluating the effectiveness of a specific piece of software as a teaching tool. Does it encourage the child's participation or does the program simply happen, unfolding like a movie, or television, without the user's input? Does the program offer choices? Can the operator influence the direction of his learning?

Rewards are an important part of learning. They give the child feedback on his progress and encouragement to continue. Rewards in educational software take a variety of forms for example, they may consist of sound, graphics, animation, comments flashed on the screen, progression to the next level of difficulty, a high score, a game accessed with the completion of the lesson, and so on.

The programmer may discourage learning, rather than encourage it, through poorly concieved feedback. Be wary of educational programs that chastise users for providing incorrect answers. Statements such as "Next time, try harder!" . . . the child may already be trying his hardest . . . or *"Wrong! Wrong! Wrong!"* do not help the learning process. Instead, they hinder it by frustrating the young operator and chipping away at his self-esteem. Many good educational programs, after a few unsuccessful attempts at a question, provide the answer. Even more effective, some programs help the child arrive at the answer.

A good teacher challenges his students. Similarly, well-designed educational software provides challenges to the users. Many programs employ a tiered learning system; children progress through various levels of difficulty. An advantage to this approach is that it allows the operators to work at their own level and at their own rate. When they become more skilled they move up the ladder. This may mean more difficult questions, less time to solve problems, more variables, and so on.

Soft Thoughts

The most effective software is produced as a combined effort between education experts and programmers. Its documentation should reveal a bit about the authors their qualifications, experience and so on. Interestingly, many of the best programs available were initially written by parents for their children.

Educational programs are often field tested in schools before being offered for sale to the public. This doesn't ensure the merits of the software but it at least demonstrates that the manufacturers have enough faith in their product to allow it scrutiny by the toughest reviewers of all, *kids!* If it doesn't pass their inspection, it's not likely to be very effective as an educational tool. **CN!**

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Diablo Printers

Programming In Dbase

The dBase II data base manager can be one of the most powerful of business packages... ahem, if you can get into using it to its fullest capacity. Here's a shot at some of the gritty details.

by Chris Vandersluis

One of the things that is inherent in all software is that it must be, by definition, finite. That is, it does what it says it will do on the box... hopefully... but that's all she wrote. This is all you can really ask for in most applications. In some however, it will lead you into oblivion with the fullness of time.

It's true to say that many large business applications one doesn't always know what is going to be required in using software. One must look into the future, a fairly misty and amorphous place, and try to predict what will be required in a few months or a few years. This is tricky, and very easy to get badly wrong. Unfortunately, with many software packages, one discovers that one has popped for the wrong software only after one has the package crammed full of a year's worth of data.

One of the many attractive features of dBase II... aside from its having really slick ads... is that it can be programmable. This doesn't mean you have to use this facility to any great depth... in most applications for it you'll be able to leave this area largely alone. However, if you do run over the ragged edge of the cliff, being able to talk dBase into doing something special for you may be the thing to pull you back onto solid ground again.

Second Base

First of all, dBase II is a program that is basically a language. It is PASCAL-like in its structure... please don't panic; it's undignified. However, it is specifically designed to work with data base files.

As languages go, dBase is pretty basic. Writing programs for it is extremely simple and essentially accomplishes stringing together the various commands available in dBase. dBase II programs are stored in text files using a word processor or the text editor that is already in dBase and are executed through the dBase interpreter.

Although this may sound complicated right now, it is one of the major advantages of dBase. A program written for dBase on the IBM PC works equally well on a Xerox or any other CP/M based machine. In fact, that program will work on any computer that runs dBase... even an Apple with a soft card.

Unfortunately, most people who are comfortable with the idea of data base managers... and have enough data to make managing it worth while... don't much like the idea of writing programs. The dBase language isn't nearly as nasty as BASIC or PASCAL... it can be mastered in almost no time. In the next couple of pages we're going to look at the structure of a simple program.

The program we'll be using as our road map through dBase is one which I designed in only a few hours. It is called the Magazine Article Tracking System... it's a variation on something I use to keep track of all the literature I read. If you have ever gone through forty or fifty magazines looking for a specific program listing or article you saw six months ago you'll know why I use this.

To use the program you must first type in the three program files I've shown here. These are

MATMENU.CMD
MATLIST.FRM
MATINIT.CMD

Use a word processor or the editor in dBase to create the files... I use WordStar in the N mode. When the three files have been entered, enter dBase, set the default drive to where ever you have the files and type DO MATMENU. The screen should clear and present you with the main menu.

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Programming In Dbase

Listing

```
MAGAZINE ARTICLE TRACKING - MATMENU.CMD
*****************************************
*                                       *
*   MAGAZINE ARTICLE TRACKING SYSTEM    *
*           MATMENU.CMD                 *
*                                       *
*      (C) CHRIS VANDERSLUIS            *
*                                       *
*                                       *
*                                       *
*                                       *
*                                       *
*****************************************

* SET THE PARAMETERS OF THE PROGRAM
SET TALK OFF
SET FORMAT TO SCREEN
SET INTENSITY ON
SET CONSOLE ON
SET PRINT OFF

* LOOK FOR THE MATDATA FILE ON THE DISK
IF .NOT. FILE('MATDATA.DBF')
    DO MATINIT
ENDIF

USE MATDATA

* LOOK FOR THE INDEX FILE ON THE DISK
IF .NOT. FILE('TITLE.NDX')
    ? "ONE MOMENT PLEASE.."
    INDEX ON TITLE TO TITLE
ENDIF

USE MATDATA INDEX TITLE

* DO FOREVER
DO WHILE T

     GOTO TOP

     ERASE
     ? "MAGAZINE ARTICLE TRACKING"
     ? "======== ======= ========"
     ?
     ? "[1] ADD RECORDS"
     ? "[2] DISPLAY RECORDS"
     ? "[3] LIST BY FIELD"
     ? "[4] FILE MAINTENANCE"
     ? "[5] REPORT ON PRINTER"
     ? "[6] QUIT PROGRAM"
     ?
     STORE " " TO choice
     ACCEPT "ENTER YOUR CHOICE (1-6) ==>" TO choice
MAGAZINE ARTICLE TRACKING - MATMENU.CMD


*  SET  UP A SERIES OF POSSIBLE CASES DEPENDING ON THE  VALUE  OF 'CHOICE

    DO CASE

       CASE choice = "1"
            STORE " " TO continue

* SET UP A LOOP SO YOU CAN CONTINUE OR QUIT
            DO WHILE continue <> "Q"

* APPEND A BLANK FORM TO THE DATA FILE
                APPEND BLANK
                ERASE

* PRINT THE PROMPTS AND GET THE DATA
                @ 1,0 SAY "TITLE     " GET title
                @ 2,0 SAY "MAGAZINE  " GET magazine
                @ 3,0 SAY "ISSUE     " GET issue
                @ 4,0 SAY "SUBJECT   " GET subject
                @ 5,0 SAY "REMARKS   " GET remarks
                @ 8,0 SAY "PRESS 'Q' TO QUIT OR RETURN FOR MORE"
                GET continue

                READ

            ENDDO
            RELEASE continue

       CASE choice = "2"
            STORE " " TO continue
            STORE "                    " TO spec
            DO WHILE continue <> "N"

* CLEAR THE MEMORY OF UNNECESSARY GARBAGE
              CLEAR GETS
              ERASE
              ? "MAGAZINE-ARTICLE-TRACKING DISPAY RECORD"
              ? "======== ======= ======== ====== ======"
              ?
              ACCEPT "ENTER TITLE TO DISPLAY" TO spec

              FIND &spec

* THIS MEANS NOT FOUND
              IF # = 0
                   ? CHR(7)
                   ? CHR(7)
                   ? "THAT RECORD IS NOT ON FILE."
                   ACCEPT "DO YOU WISH TO CONTINUE(Y/N)?" TO continue
              ELSE
                   STORE " " TO option
                   DO WHILE option <> "Q"
                   ERASE
                   @ 1,0 SAY "TITLE     " GET title
                   @ 2,0 SAY "MAGAZINE  " GET magazine
                   @ 3,0 SAY "ISSUE     " GET issue
MAGAZINE ARTICLE TRACKING - MATMENU.CMD

                   @ 4,0 SAY "SUBJECT   " GET subject
                   @ 5,0 SAY "REMARKS   " GET remarks
                   ?
                   ? "(E)DIT (D)ELETE (R)ECALL (Q)UIT"
                   ACCEPT TO option

* THIS CONVERTS OPTION TO UPPER CASE
                   STORE !(option) TO option

                   DO CASE
                        CASE option = "E"
* EXECUTE THE @ GETS AND GET NEW INFORMATION OR ACCEPT DEFAULT INFORMATION
                             READ

                        CASE option = "D"
* STORE A DELETION MARK IN THE RECORD
                             DELETE
                             ? "RECORD DELETED!"

                        CASE option = "R"
* REMOVE THE DELETION MARK FROM THE RECORD
                             RECALL
                             ? "RECORD RECALLED!"

                        CASE option = "Q"
                             ?
* IF NONE OF THE CASES ARE PICKED...
                        OTHERWISE
                             ? CHR(7) + CHR(7) + CHR(7)
                             ? "INVALID ENTRY!"
                   ENDCASE

                   ENDDO

              ENDIF

         ENDDO

       CASE choice = "3"
            STORE " " TO continue
            STORE "                    " TO spec
            STORE " " TO option

            DO WHILE continue <> "N"
              ERASE
              ? "MAGAZINE ARTICLE TRACKING LIST RECORDS"
              ? "======== ======= ======== ==== ======="
              ?
              ? "LIST BY WHICH FIELD?"
              ?
              ? "[1] TITLE"
              ? "[2] MAGAZINE"
              ? "[3] ISSUE"
              ? "[4] SUBJECT"
              ? "[5] REMARKS"
MAGAZINE ARTICLE TRACKING - MATMENU.CMD

              ? "[6] DELETED RECORDS"
              ?
              ACCEPT "ENTER YOUR CHOICE (1-6) => " TO option
              ?
              ?
              ACCEPT "ENTER SEARCH STRING=> "TO spec

              DO CASE
                   CASE option = "1"
                        ERASE
                        ? "LIST BY TITLE"
* LOCATE SIMPLY FINDS THE RECORD
                        LOCATE FOR title = spec
                   CASE option = "2"
                        ERASE
                        ? "LIST BY MAGAZINE"
                        LOCATE FOR magazine = spec
                   CASE option = "3"
                        ERASE
                        ? "LIST BY ISSUE"
                        LOCATE FOR issue = spec
                   CASE option = "4"
                        ERASE
                        ? "LIST BY SUBJECT"
                        LOCATE FOR subject = spec
                   CASE option = "5"
                        ERASE
                        ? "LIST BY REMARKS"
                        LOCATE FOR remarks = spec
                   CASE option = "6"
                        ERASE
                        ? "LIST DELETED FILES"
                        LOCATE FOR *
              ENDCASE

              STORE " " TO search

* CREATE A LOOP TO SEARCH THROUGH THE FILE SEQUENTIALLY
              DO WHILE .NOT. EOF .AND. .NOT. !(search) = "N"
                   ERASE
                   @ 1,0 SAY "TITLE     " GET title
                   @ 2,0 SAY "MAGAZINE  " GET magazine
                   @ 3,0 SAY "ISSUE     " GET issue
                   @ 4,0 SAY "SUBJECT   " GET subject
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Programming In Dbase

```
                    @ 5,0 SAY "REMARKS    " GET remarks
                    ACCEPT "CONTINUE SEARCHING(Y/N)? " TO search
* CONTINUE WITH THE LOCATE COMMAND
                    CONTINUE

               ENDDO
                 ? "THAT'S ALL..."
                 ACCEPT "DO YOU WISH TO CONTINUE(Y/N)? " TO continue

            ENDDO
MAGAZINE ARTICLE TRACKING - MATMENU.CMD


        CASE choice = "4"
             SET TALK ON
* REMOVE ALL RECORDS MARKED FOR DELETION
             PACK
             SET TALK OFF

        CASE choice = "5"
             ERASE
             STORE " " TO option
             ? "MAGAZINE ARTICLE TRACKING  REPORTS"
             ? "======== ======= ========  ======="
             ?
             ? "SORT BY WHICH FIELD?"
             ?
             ? "[1] TITLE"
             ? "[2] MAGAZINE"
             ? "[3] SUBJECT"
             ?
             ACCEPT "ENTER YOUR CHOICE (1-3) =>" TO option

             DO CASE

                  CASE option= "1"
                       USE MATDATA INDEX TITLE
                       REPORT FORM MATLIST TO PRINT

                  CASE option= "2"
                       ? "INDEXING ON MAGAZINE..."
                       SET TALK ON
                       INDEX ON MAGAZINE TO MAGAZINE
                       USE MATDATA INDEX MAGAZINE
                       REPORT FORM MATLIST TO PRINT
                       SET TALK OFF
                       USE MATDATA INDEX TITLE

                  CASE option= "3"
                       ? "INDEXING ON SUBJECT..."
                       SET TALK ON
                       INDEX ON SUBJECT TO SUBJECT
                       USE MATDATA INDEX SUBJECT
                       REPORT FORM MATLIST TO PRINT
                       SET TALK OFF
* GO BACK TO THE ORIGINAL INDEX FILE
                       USE MATDATA INDEX TITLE
             ENDCASE

             STORE " " TO choice

        CASE choice = "6"
             SET TALK ON

* EXITS DBASE ALTOGETHER.  CHANGE THIS TO CANCEL TO STAY IN DBASE.
             QUIT
    ENDCASE
ENDDO
```

MAGAZINE ARTICLE TRACKING

(1) ADD RECORDS
(2) DISPLAY RECORDS
(3) LIST BY FIELD
(4) FILE MAINTENANCE
(5) REPORT ON PRINTER
(6) QUIT PROGRAM

ENTER YOUR CHOICE (1-6)

Let's go through the options one at a time.

The first option allows you to add a new record to the file. You will be able to input the article title, the magazine name, the issue number or date, the subject matter and a brief description of the entry. The program will give you the choice of continuing to enter data or returning to the menu.

The second option has several functions. To begin with, it allows you to locate and display a particular record. You may then edit the entry, mark it for deletion or remove a previous mark for deletion.

Marking a record for deletion doesn't remove it... it simply tags it as being expendable so that dBase can remove it when you next pack the records.

The third option allows you to display a series of records that match a specification that you define. For example, you might ask

the program to display all the records with a subject of education. The program would then display these records one at a time and ask if you wanted to continue the search or return to the menu.

Th fourth option allows you to maintain your file, invoking the dBase record packing facility.

The fifth option lets you choose one of three reports available and have it printed on the printer. The reports are all in the same format but are sorted... actually indexed... differently. The program will report by title, by the magazine name and by subject.

Finally, the sixth option return you to the operating system.

Start Typing

If you want to jump right in and enter the program, go ahead. You will find the listing well documented with remarks. If all of this still sounds like Greek to you, don't despair. We will go through the program step by step and learn about programming in dBase at the same time.

When entering a listing, it may be helpful to bear in mind that a couple of conventions are used which, while not strictly speaking required, do make reading and debugging the program much easier.

First, all variables are entered in lower case. In this way, you'll be able to pick them out at a glance. Variable names are one of the largest sources of errors in programs.

Second, all loops are indented. I can't stress how important this is. When you have eight nested loops the possibility of not

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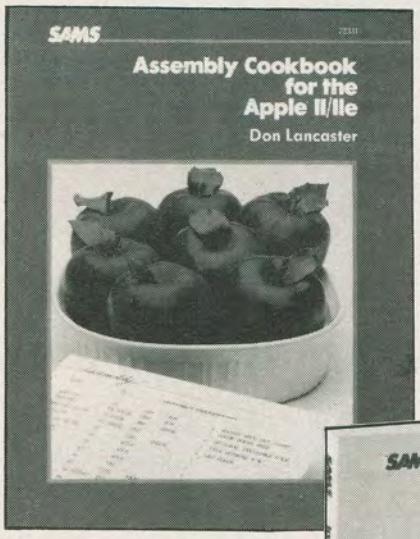

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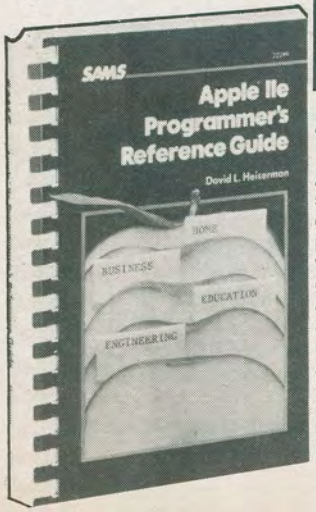

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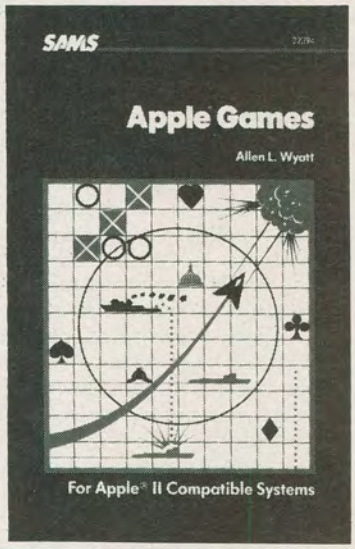

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Programming In Dbase

closing one increases exponentially.

Finally, I remark each section of the program with a note telling me what it does so that I can return to it quickly if need be. A remark is entered by having a '*' as the first character in its line.

Let's consider these listings. What you may notice first is that there are three separate programs. The first is called MATMENU.CMD. The second is MATINIT.CMD and finally there is MATLIST.FRM. dBase II uses several different file extensions. CMD files are command files containing program instructions, while FRM files are report formats containing the instructions to dBase for how to print out a particular columnar report. MEM files are files in which variable names and values are stored.

In this way you could save variables that would be transferred from program to program.

Files with FMT as their extensions are screen format files. They tell the program that you would like to put and get data to the screen in a particular fashion. DBF files are database files in which your data is stored. Finally, NDX files contain indexes of a particular field for a particular database.

In the program we'll be using, there are two CMD files and one FRM file. The database and its indexes are created by the program during execution.

If you've stuck with me this far, you must be ready to get into the meat of the program. The first section adjusts dBase to best suit the program. Let's look at these parameters one at a time. SET TALK OFF tells dBase not to add its own comments during the program, as it usually does. SET FORMAT TO SCREEN instructs dBase to be sure it is using the regular screen layout for editing and adding information. SET INTENSITY ON is for those screens with inverse or variable intensity video and highlights certain portions of the screen. SET CONSOLE ON allows output to the regular video terminal. This is the default setting but we'll make sure anyway. Finally, SET PRINT OFF ensures that the printer has been turned off.

There are several other parameters that can be adjusted. One of the most used is changing the default drive. This is done with the command SET DEFAULT TO B.

When writing and debugging your programs check to see how you would like dBase to act then set your parameters accordingly. You can change almost all the features of the program. A complete list of the parameters along with their default values is in the manual.

The next few lines of the program handle the existence of the data files required to run the program... or lack thereof. The IF THEN structure is a conditional statement. If the condition is met in the first line, the program will execute all the subsequent instructions until it sees the matching ENDIF command. dBase II also recognizes the ELSE command within the statement to handle instructions and commands if the condition is not met in the first line. Examples of this occur later on in the program.

The first of these statements looks for the file MATDATA.DBF. If it isn't found, the program calls a second program called MATINIT, the third listing, which will prompt the user through the creation of MATDATA.DBF. The user will then be returned to the proper place in the MATMENU program.

dBase allows you to call such subprograms from one another. This is a very powerful aspect of the software. By doing this you can make extremely complex systems using many different modules that will work together.

The second conditional statement looks for the index file and, if it is not found, re-indexes the MATDATA file on the TITLE field. The result of all this is that the program is set up to use the MATDATA file indexed by title.

```
? "*****************************************
? "*                                       *
? "*    MAGAZINE ARTICLE TRACKING SYSTEM   *
? "*              MATINIT.CMD              *
? "*                                       *
? "*          (C) CHRIS VANDERSLUIS        *
? "*                                       *
? "*                                       *
? "*                                       *
? "*                                       *
? "*                                       *
? "*****************************************
?
?
?"THIS MODULE WILL HELP YOU TO CREATE THE"
?"DATABASE FILE FOR THE MAGAZINE ARTICLE"
?"TRACKING SYSTEM."
?
? "YOU WILL BE SHOWN WHAT TO ENTER."
? "ENTER IT EXACTLY! AS SHOWN."
? "           ========= "
WAIT
ERASE
? "ENTER RECORD STRUCTURE AS FOLLOWS:"
? " FIELD    NAME,TYPE,DECIMAL PLACES"
? " 001      TITLE,C,25"
? " 002      MAGAZINE,C,10"
? " 003      ISSUE,C,5"
? " 004      SUBJECT,C,10"
? " 005      REMARKS,C,20"
? " 006 <RETURN>
? "INPUT DATA NOW?N"
?
CREATE MATDATA
USE MATDATA
INDEX ON TITLE TO TITLE
```

Now we come to a DO WHILE loop. This type of loop usually uses a variable to determine the validity of a condition and executes all instructions it finds before it encounters the matching 'ENDDO' command. When it sees ENDDO, it loops back to the beginning of the loop and re-evaluates he condition to see if it is met.

If the condition is not met, the program jumps to the instruction immediately following the loop.

In this particular example, we want to set up a loop that will continue until the program is exited so we use DO WHILE T. T stands for true and is a condition that is always met. By nestling these loops, one within the other, we will be able to handle very complex situations.

Let's go on. Next we will set the data pointer to the very beginning of our data file, GOTO TOP, erase the screen and print the main menu using the standard dBase print command, the question mark. Unlike as in BASIC, this is not a short hand method of entering PRINT. This is the simplest and most straightforward method of printing to the screen.

The user is prompted to enter a choice which we will store in the variable *choice*. Depending on the selection of the user, we will want to perform different functions. We could do this with conditional IF ENDIF statements but here we have used the DO CASE END CASE structure that is specifically designed for this function.

DO CASE starts a string of conditional statements each starting with CASE and a condition. Here the first one is

CASE choice = '1'

The program will examine the variable *choice* and if its value is equal to one will execute all the subsequent commands to the point where there is the next CASE command or an ENDCASE. Unlike the DO WHILE ENDDO loop, this structure will not automatically loop back on itself. If none of the cases are found to be true, then none of the commands will be executed. In this situation, the program will continue until it finds the end of the DO WHILE loop that we set up and will start over again with the menu.

If you are feeling somewhat overwhelmed, don't worry. Go get a coffee and take a five minute break. I'll still be here.

Down To Cases

Let's continue with the subsections. You may have noticed that there were six choices on the menu. Understandably there are six CASES, or subsections.

CASE *choice* = "1" is for adding records to the data file. At the beginning of each section we will do declare the variables that we will be working with.

dBase II requires that you define variables before you work with them for many of its functions. We do this by giving the variables a default value. For example, we say

continue = ' '

```
M=0,L=58,W=80
Y
Magazine Article Tracking Report
N
N
25,TITLE
Title
10,MAGAZINE
Magazine
5,ISSUE
Issue
10,SUBJECT
Subject
20,REMARKS
<Remarks
```

Next, if appropriate, we will begin a loop within which we can do the function until the user decides to return to the main menu.

In this section, we add records by first using the APPEND BLANK command. Next we will want to prompt the user to enter the data and place that data into the record. We do that by using

Programming In Dbase

the @ SAY and @ GET commands to format our data input screen. The command SAY is another way of printing to the screen. It puts the requested information in a specific x,y co-ordinate. An implementation might go 1,0 SAY "Title".

The GET command allows data input at a particular place on the screen. It will place a blank field the length of the defined variable to be input and a cursor at the beginning of the line at a specific x,y co-ordinate on the screen. One might say @ 15,0 GET *title*.

The SAY and GET commands are format instructions to dBase. They must be invoked by using the READ command, as you see. By combining these two commands, we will have our prompt line and data input on one line.

What I have done here is to use the actual field name instead of a variable name for data entry. This gives us two advantages. First, we will not have to declare all those variables at the beginning of the section and second, by doing this we place data directly into the record and eliminate the need for a subroutine to do this.

This sector ends with ENDDO which allows the program to complete its loop and check the *continue* variable. Finally the variable is RELEASED from memory because dBase can keep track of only sixty-four variables at one time.

The next section is *choice* = "2", which is the display and edit function. What we want to accomplish here is to be able to call up a record and then edit or delete it as we wish.

Once again we declare our variables and set up a conditional loop within which to work. We prompt the user for the title of the article that he is looking for and we store that value in the variable *spec*. We then use the FIND command to search for the record... remember that we are using the file MATDATA and are indexed by title.

If dBase cannot find a record, the data pointer will equal zero. You can always find where the pointer is by accessing the system variable '-'. We have, therefore, put in a conditional statement to tell the user if the record is not found. Otherwise... ELSE... display the record and proceed.

To display the record we use the format found in the add records section. This will display the prompts and the current values of the fields. Now you have a choice of what to do.

Once again we set up a series of CASES. Because we are using letters here instead of numbers, we want to be sure that dBase recognizes the upper case regardless of which is typed in. We do this with the '!' command. STORE ! *option* TO *option* will convert the value of option to upper case.

The first choice, E, invoked the READ command and will allow the GETS to be executed so that you can enter data. The default current values will be kept if RETURN is pressed at each field. If the D option is selected, the DELETE command marks the record for deletion. Similarly the R option, RECALL, removes the deletion mark.

If Q is selected a simple PRINT '?' command allows the loop to end. At the end of the cases is the OTHERWISE command. This is similar to the IF ELSE condition and lets us execute three beeps if none of the cases are met.

We'll now move on to the list records option, number three. Here we print a small menu that lets the user choose the field by which he wishes to search. We set up another series of cases to use the LOCATE command.

LOCATE allows you to find a record by searching sequentially through the data file instead of by the index. You do not, therefore need to have indexed that particular field to locate the record. LOCATE is similar to FIND in that it will not automatically display the record, just locate it.

The only new thing in the options is option six, which will list deleted files, that is, those with asterisks in them. This is the deletion mark we discussed earlier. Now we need to set up a subroutine that will display the records. We will use our by now familiar format. The CONTINUE command that follows the format simply tells the computer to continue searching. The section ends with a prompt to the user asking if he wants to continue and assigning a value to *continue* before looping back.

Choice four handles file maintenance by executing the dBase PACK instruction. We SET TALK ON and then SET TALK OFF so that dBase will let the user know what is going on during the process.

The fifth case is the report section. Here we allow the user to choose the field by which he or she would like the report sorted and then we set up three cases to handle them. This is a remarkablysimple task. Option one is the easiest as it uses our regular title index and for options two and three we need simply tell dBase to create an index file for that field and then USE the data file indexed with that index file. To print the report we use the command REPORT FORM MATLIST TO PRINT. If you remember, MATLIST is the FRM file we entered as listing two.

Finally we come to choice six. The QUIT command closes all files and exits dBase regardless of what loops we may have created. This will return the user to the operating system. If you want to modify this so that you leave the program but not dBase, then change QUIT to CANCEL. This will return the user to the command level of dBase.

QUIT

Well that's about it. We've barely scratched the surface of this versatile language but we have created a program that is both useful and powerful. At the very least, it should serve as a model for your own dBase programs. Each of the routines we used here can be applied to other analogous situations.

Try writing some dBase code... you'll be surprised at how easy it is once you try it... and how powerful you can make dBase for your applications. **CN!**

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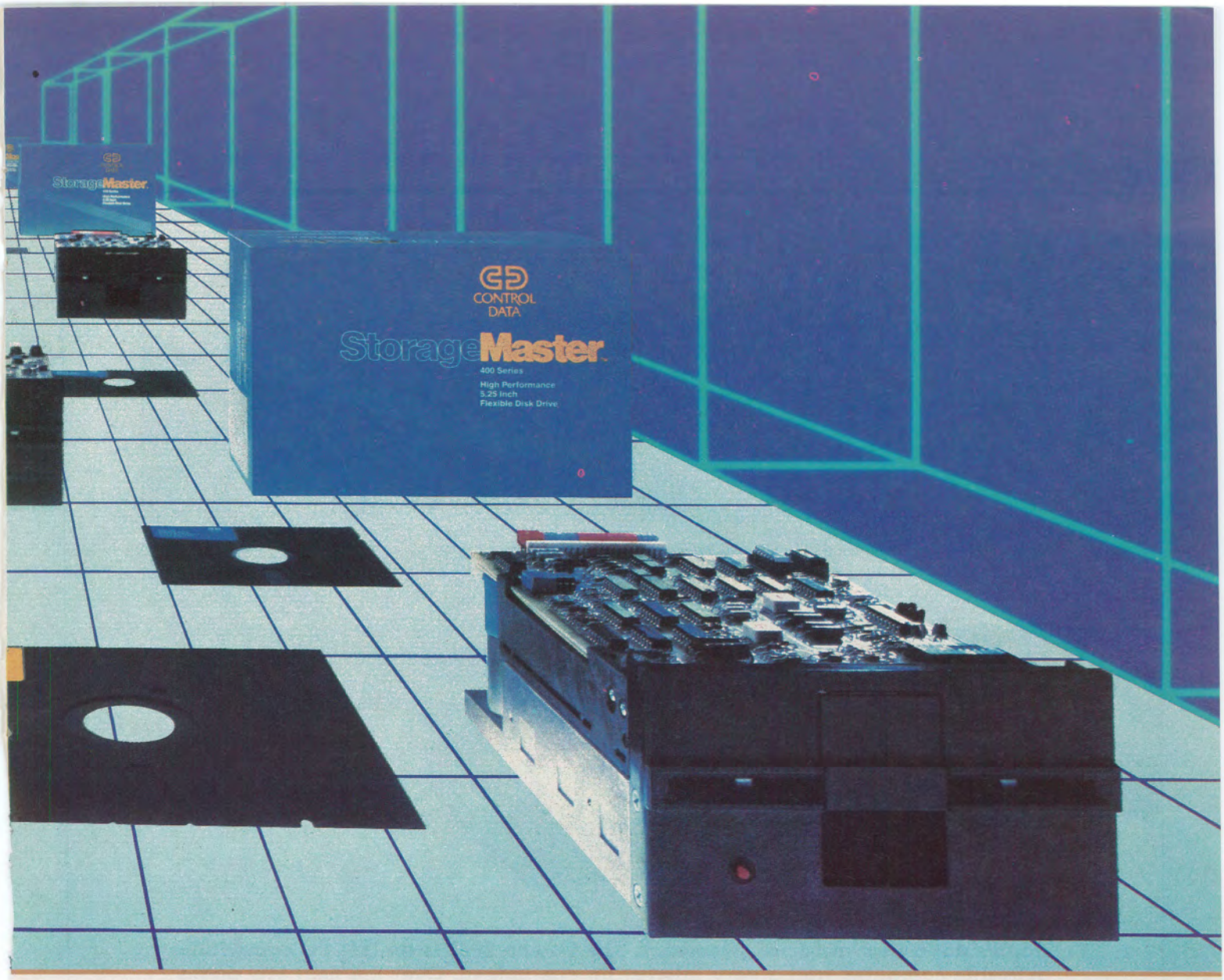

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Otrona Review

No, it's not a new artificial sweetener. The Otrona 2001 is an IBM PC compatible portable computer, and a very interesting one indeed. Over the next few pages we'll pop it's top and take it for a spin.

by Steve Rimmer

Portable computers have aways had a number of things in common. They almost all resemble world war two army field radios, both in their general demeanor and in their mobility. The sumo wrestler to carry your system is an optional extra. They are also traditionally limited in one respect or another in comparison to a desk top system with the same specifications. At the very least, one can expect to find one's self peering at a screen that's one size too small set at the perfect angle for a munchkin.

It would be untrue to say that all of this bad karma vanishes the moment you lay your plastic down for an Otrona 2001. However, unlike virtually all of the other portable systems which have emerged since the rise and subsequent fall of the Osborne empire, this machine actually has had some clever innovative thought put to it to make it both more portable and more useful. I wouldn't swap it even for my large, permanently installed, immobile PC look alike clone, but in many applications it manages to perform the functions of a full sized box with remarkable dexterity.

On top of this, it looks extremely interesting.

Pop Top

The most obvious aspect of the Otrona is that of its tube. The monitor is actually in a separate box... it associates itself with the computer proper through a massive plastic hinge and a cable. When it's sleeping the monitor merges with the rest of the machine to form a chunky square case. However, it can flip up into any of four elevated viewing positions, held in place by a wire bale. The viewing position when the monitor is looking at the sky is pretty acceptable.

The monitor itself comes in a number of permutations. We got a monochrome version with an amber screen, but there also exists a colour Otrona. The monitor, while not as sharp as some I've checked out, isn't half bad. Ours bloomed a bit in the corners and a had a number of other eccentricities. However, the party that sells Otronas told us that what we got was actually a pre-production box, and that the real live ones will come with sharper and more uniform displays.

In its closed position, the monitor is protected by the keyboard, which snaps onto the front of the whole affair. The arrangement for this is a bit funky, but it looks like it will hold together. Another wire bale, this one to prop up the keyboard, likes to get in

the way when you try to close the whole works up for tooling about, as does the curly cable that connects the keyboard to the rest of the beast. However, these are minor hassles if you keep your head into looking out for them.

The Otrona keyboard itself is an interesting variation on the usual IBM style endeavour... made necessary, to some extent, by the compact nature of the system. It consists of a collection of off white and sort of grey brown keycaps which do all the functions of the PC keyboard. Like the PC keyboard, it has an extremely light touch, with a particularly strange feel to it. It's fairly easy to work with after you get used to it, and one can develop a reasonable amount of speed at it. The keyboard we had was a bit unreliable on a few of its keys... most likely as a result of having been bounced around through several reviewers previously.

As with all PC style keyboards, it seems, the tactile feedback of the Otrona's plank is about nil.

The keyboard layout is actually a bit less strange than that of a true IBM... this, however, is as subjective as the question of the keyboard's feel. The function keys, for example, are in a row along the top of the keyboard instead living in two columns to the side of the alphabetic pad, as is usually the case.

Having the keys so placed doesn't really affect their usefulness *per se*, but it can make some applications a bit less convenient. Quite a number of programs make use of the function keys and, in many cases, the physical position of the keys is important. I played with the Microsoft Flight Simulator on the Otrona as part of evaluating the machine... not surprisingly, the positions of several of the virtual airplane's control settings corresponded to the physical positions of the function keys on a real PC... but were fairly meaningless on the Otrona.

The function keys are immediately below a slot designed to hold a plastic or cardboard strip that would normally bear the meanings of the function keys under various applications. This helps... if you make yourself a card for each of your applications.

It's also worth noting that many packages come with plastic templates designed to fit over the PC keyboard and make finding the functions as easy as possible. This is especially helpful for really complex little monsters under which most of the keyboard can often find itself redefined. Obviously, the Otrona would be at something of a disadvantage when confronted with one of these.

There are a number of very positive features to the Otrona's keyboard too. The best of these, I think, is the existence of easily visible status LEDs for the caps lock key. What's more, the two states of this often offending instrument are indicated by two different coloured lights, making it easy to spot what it's about to lay on you.

Otrona Review

Kraft Dinner

It may be a personal thing, but the unusual colour of the amber monitor which came with our Otrona kept making me think of Kraft dinner. Now, I can relate to the occasional commercial for the stuff... I've even eaten it occasionally when there were no lizards or old shoes or other more palatable substances quickly at hand... but staring at the stuff or hours on end can do your head in. What's more, it seemed to form itself into words...

The Otrona boots extremely quickly, giving you a silly logo to look at while it's clicking and popping. It checks itself out, printing up several status messages... such as whether the keyboard is working properly... and bops into MS-DOS. Amber flickers everywhere.

The Otrona DOS... an implementation of MS-DOS 2.0... is really pretty boring. Having reviewed what seems like a medium sized in ground swimming pool filled to the brim with PC clones I was sort of half hoping for some colourful innovations attached to the DOS. I mean, if it had crashed and filled the screen full of odd characters it would have been something new to write about.

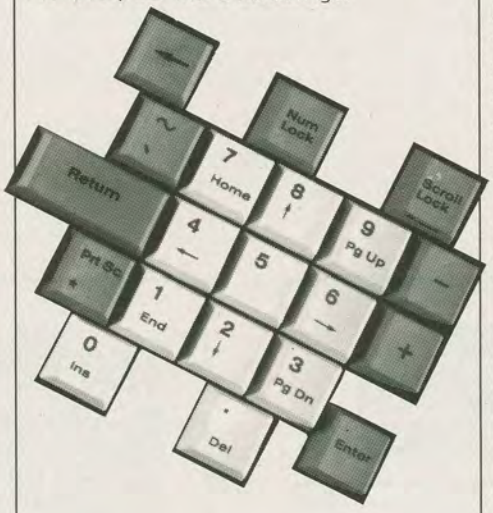
DOS on the Otrona behaves entirely predictably. In fact, we gave the system considerably more of a jog 'round the block than we usually do for evaluation machines. I used it to write several bits of software, including the *Celestial Mechanic* in the October edition of Computing Now!. We later troddled it out to the recent Software Faire trade show for four days of prodding by the tourists. DOS continued to be boring throughout, never once hanging or even emitting an audible burp.

This is actually a pretty decent record... most systems do crash occasionally, both because of minor software hassles and due to power line glitches. Trade shows, with their instant electrical wiring, are notably bad for this sort of thing. While not one bit as interesting as a thunderous explosion from one of the drives might have been, this quiet perseverance is reasonably impressive.

It is also a credit to the box that we were unable to find any software which wouldn't run on it... except for the time somebody put a Commodore 64 disk into the thing by mistake. Even the house teddies, like the flight simulator and a few home grown benchmarks designed to hang up on anything even a bit weird sailed through the drives like an oil slick headed for a crowded beach. I'm told that a lot of effort went into the compatibility of the Otrona.

It is fair to say, however, that not everything that ran on the Otrona did so as quickly as it did on other systems. The differences varied. WordStar seemed to be about up to steam. Microsoft BASIC, however, was notably slower, especially if it had to handle a lot of graphics. The one armed bandit program, from the June edition of Computing Now!, is a reasonably swift thing under most other systems but, being graphics intensive, is a turtle on the Otrona.

Certainly if one is considering buying an Otrona for business applications... it is expensive to use as an arcade game... slow graphics will not be a serious problem. However, this was a bit strange.



Using a wide range of software on the Otrona turned up no peculiarities in its operation. Some of the stuff that we ran on it was extremely decent with the amber tube... the characters which have their attributes set are still quite readable, which is not the case with many systems.

Below The Salt

One of the things that we get to do to evaluation systems... and most casual users don't, at least not before they buy them... is to void their warranties and rip the covers off them. Some of the nicest looking computers are real jungles inside.

The Otrona is extremely small and, as one would suspect, pretty tight inside. There are a number of things about the construction of the thing which would give one cause to shake a bit. While it's mechanically fairly solid... there are some really nicely engineered aspects to the works... there are also a few decided weak points to it.

The Otrona is, first of all, a completely unexpandable system. It consists of a three slot motherboard of sorts, of which two of the slots are filled and one isn't even socketed... it's largely unusable due to space constraints. There are no electronic components on the motherboard... it just holds the sockets.

The two boards which plug into the slots are about as dense as these things get, having several piggyback boards popped on top of their existing circuitry to get still more chips in the available space. The whole circuitry area of the Otrona's case is about the size of a large paperback novel.

The Otrona comes with a serial port, a parallel port and an external video connector running out of the side of its case. The video connector uses a nonstandard arrangement through an RS-232 style D connector. This is all the I/O the machine has, and, because it lacks useable peripheral slots, all it ever will have. Now, this is enough for most of the usual applications for PC's. However, for example, if you wanted to have a mouse and a modem plugged into your system you would encounter something of a port shortage.

Some of the internal design aspects of the case arrangement are disturbing. The pins of the sockets on the motherboard are pressed right up against the steel back of the case. They've been covered with strips of cloth tape to keep them from shorting, but this does not look profoundly secure, especially inasmuch as the motherboard does vibrate around a bit, being supported by the cards plugged into it instead of the other way around.

The most worrying question concerning the Otrona's construction, however, is the long term stability of its circuitry. It gets extremely hot in there. The box does feature a cooling fan, but it's sequestered away in the cavity which holds the power supply, with little air making it into the component section.

In fairness, the system didn't show any signs of heat relate glitches while we were using it, but the temperature inside the case is probably enough to measurably shorten the life of some of the parts in the system.

Also in fairness, I haven't seen a portable system yet that didn't toast a bit... the Otrona doesn't get any hotter than most. It also seems to be made of better than average electronic parts, which will overcome this problem to some extent. I wouldn't think that the mean time between failures of an Otrona would be anywhere near as good as that of a real IBM, or of

most full sized desktop systems, but it would be hard to estimate what the difference would be.

The distributor wasn't interested in loaning us the system for five years so we could check up on this further.

Truckin'

The Otrona 2001 is a decent little box, considering both its features and its minor glitches. It is certainly among the best portable PC compatible systems I've tried... it's unquestionably the most innovatively designed. It's comfortable in use and its software compatibility is admirable.

I think that, being portable, it would have been a marginally better trip had its power supply been able to accept an assortment of line voltages... ours came permanently hungry for an exclusive diet of North American one ten.

The price of the system... about five thousand dollars when all the dust settles... is not quite so admirable. In fact, it's probably a bit steep as there is nothing in the system which is different from the guts of a three thousand dollar desk top system. The slightly more elaborate case and the amber tube can't be said to account for two grand. However, what one is prepared to pay for a system will largely be determine by what one is going to do with it.

If you need a portable, and can afford an Otrona, there are few choices which will leave you with a better computer. There are none which will avail you of a better conversation starter.

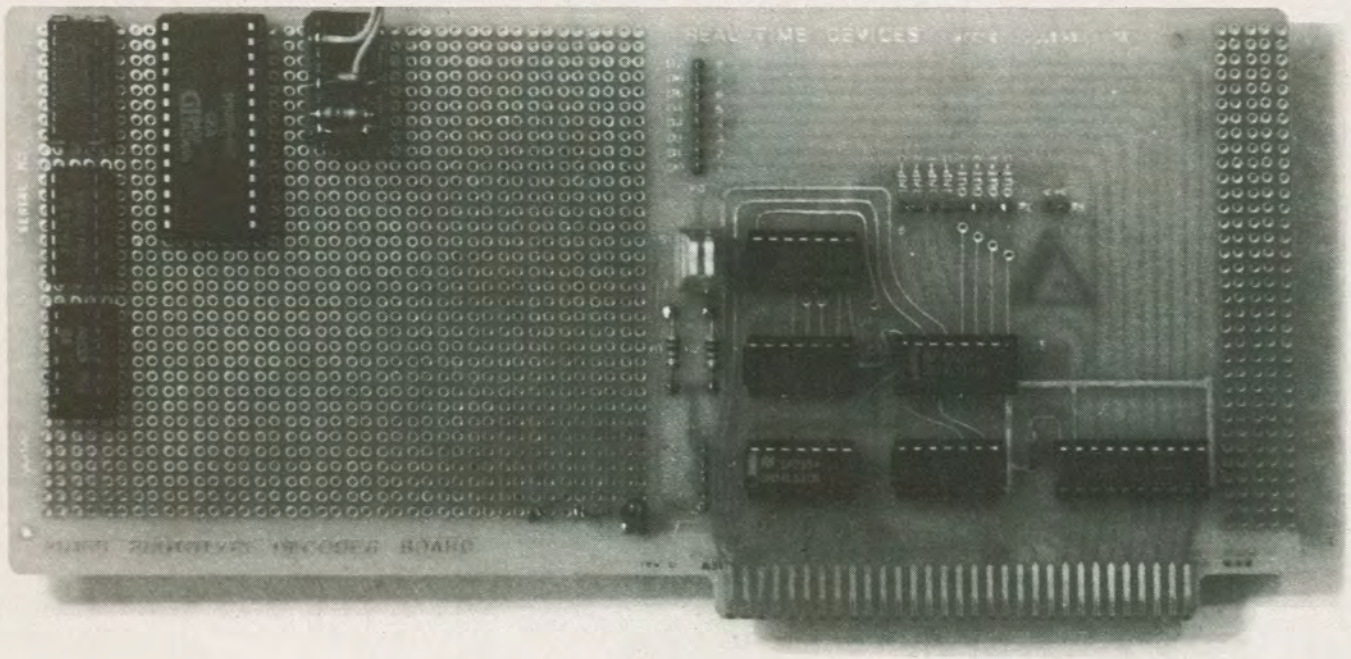
The system also traps mice if you can lure them under the monitor and release the wire bale before they can escape. **CN!**

Specs

System:	**Otrona 2001**
Processor:	**8088**
Memory:	**256K**
Graphics:	**640 x 200 pixels**
Display:	**Monochrome amber monitor**
Disks:	**2 340K DDSD Teac Drives**
Distributor:	**Scarsdale 500, 2 Bloor Street East, Toronto, Ontario 1-416-923-5000**
Manufacturer:	**Otrona Advanced Systems Corporation**
Price:	**$4495 (varies with options)**
Operating System:	**MS-DOS 2.0**

PC NOW!

The PC Proto Card



Designing and building computer hardware can be like trying to solve an equation with twelve variables on your fingers. Here's a look at an intelligent prototype card for the IBM PC which eliminates a lot of the drudgery and much of the guessing.

by Brian Greiner

There's something wonderful about creating a custom circuit for a computer... a feeling of triumph, a flush of creativity. Most of all, one experiences a feeling of relief that the nasty thing is finally finished.

Hardware design has its glorious moments, but there is an awful lot of dull interface circuitry which precedes any great application. Inherent in the notion of connecting a device to a computer is the essential glue that makes it communicate with the system buss.

The IBM PC is among the worst of systems to design hardware for in this light, as its buss interfacing is, not surprisingly, fairly involved. It's not all that difficult or complex but the sorting out of the required signals and the timing considerations one encounters are quite the handful.

Furthermore, you have to build up the interface every time you want to do something different. It's dull, it's tedious, and it interferes with the creative process. What is needed is a prototype card with the interfaces already on it, all designed, built up and working, ready to interface to the circuitry of your imagination.

Actually, what is needed is a PD100 from Real Time Devices, a little slab of fiberglass which is just that.

Board of the Rings

The PD100 consists of the address decoder and data buffer circuitry required for a circuit to interface with the PC's buss... plus a large prototyping area.

Physically, the board is eight and a half inches wide by almost four inches high, exclusive of the mounting pins. The prototyping area is divided into two areas, the largest having thirteen hundred and twenty holes on tenth of an inch centres and occupying about half the area of the board.

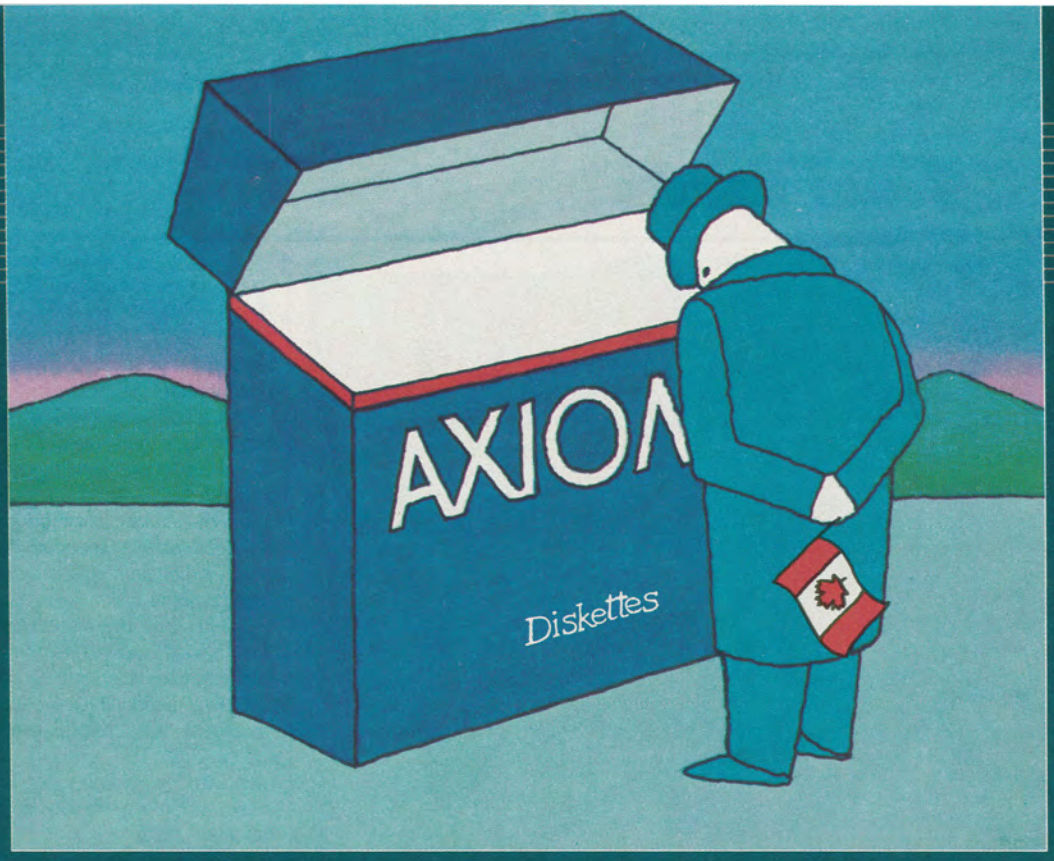
The second, smaller area has a hundred and seventy holes. It would normally wind up located on the side that is closest to the rear panel of the PC's chassis, making it useful for mounting externally accessible connectors and such.

The holes are plated through donut pads suitable for soldering or wirewrapping.

The signals available from the on board circuitry include four output strobes, four input strobes, an eight bit data bus and the power supply voltages. The signals are accessed from three wire wrap terminal strips. The address decoding circuitry includes switches that allow the user to select one of four unique address ranges.

The board is well designed. All the chips languish in sockets, making them easy to replace if one should snuff it... not an unlikely eventuality considering the use to which the board will probably be put. The buss connector strip is gold flashed... again, a necessary feature if the card is going to find itself in and out of the machine frequently. The output connectors for the signals are clearly labeled, as are the pins for each signal.

The board is useful by itself, but to a limited number of people. What really



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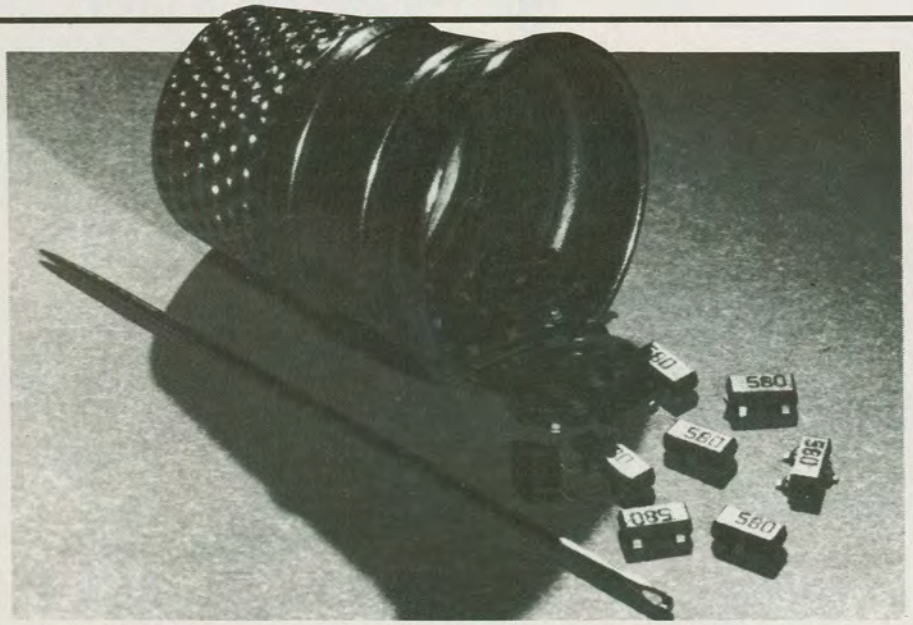

makes it interesting is the documentation that comes with it. Yes, amazing as it may sound, this prototype board comes with a moderately rotund little manual. Called "Interface Projects for the IBM PC" the book is a spiral bound, one hundred and sixteen page affair that details the PD100 and serves as an excellent tutorial text on the subject of interfacing.

The book is excellent, covering basic buss interfacing concepts, the IBM PC's hardware as it relates to the use of the card, the theory behind the PD100's circuitry, the mechanics of prototype construction, different types of input and output transducers, analog interfacing techniques and four experiments.

It also has several appendixes detailing the PC's memory and I/O address maps, the PC's buss signals and complete details of the PD100.

The book concludes with a twenty-eight article bibliography of magazine articles that deal with interfacing techniques and projects.

Although the treatment of the topics in the manual tends to be brief, this book is the best introduction to interfacing with the PC that I've seen. It does assume a passing familiarity with digital electronics, but not too much. The authors are to be congratulated on a fine job... without too much work, it could probably be expanded into a full sized book.

The only gripe one could level against the book is the quality of its printing. The text has obviously been printed out on a dot matrix printer, and is faded in spots.

Specs

Device:	**PD100 prototype development board**
System:	**IBM PC**
Size:	**8.5 x 3.8125 inches**
Manufacturer:	**Real Time Devices, 1930 Park Forest Avenue, P.O. Box 906, State College, PA 16804**
Distributor:	**Real Time Devices**
Price:	**$99.00 plus $2.50 shipping (US)**

Solder Suckers

The PD100 is a well thought out, well built and exceedingly well documented device. It will be of interest to those who wish to construct their own interfaces for the IBM PC. Its thorough manual will allow even relative neophytes to get working hardware going in a few hours, while, at the same time, minimizing the danger of doing something uncool and frying one's computer.

The price of the card is also definitely right... converted to Canadian dollars it works out to about twice what a bare IBM style prototyping board would cost. **CN!**

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Circle No. 13 on Reader Service Card

Survey of PC Compatibles

Despite critics bemoaning the ancient architecture of the IBM PC and its increasing supply of operating systems and software, it seems there are a lot of manufacturers out there trying to get in on its phenominal success...

Back in Computing Now!'s first issue, April 1983, we compiled a survey of fifty systems, of which seven were MS-DOS compatible. This worked out to fourteen per cent. September 1983's survey of one hundred (actually ninety-seven) systems had twenty-three MS-DOS compatibles, weighing in at about twenty-four per cent of all listed systems. April 1984's survey of one hundred and fifty-five micros had fifty-three MS-DOS systems, or a percentile of thirty-four. MS-DOS compatibles numbered sixty-eight out of September 1984's survey of one hundred and sixty-six, constituting a bit less than forty-one per cent.

There are eighty-six systems listed below, a significant rise from the fifty-seven in our June 1984 CN! coverage of MS-DOS compatibles.

What all these figures mean is perhaps unclear, but if the trend to MS-DOS compatibility continues, within a couple of years there won't be anything else out there. Trends tend to usurped by other trends, though... the new combination UNIX and dishwashing computers from Maytag look good...

Name	Processor(s)	RAM	Printer I/O	Disk Drives Inc.	Graphics	Colour	Software Inc.	Manufacturer	Available From	Suggested Retail	Other
Associate	Z80A or optional 8088	128K	3 serial, one IEEE, optional parallel	Two DSDD 5¼" floppy or optional 10 mb hard drive	32 graphics characters, 256 user definable	Optional	Microplan, Spellbinder, acc pak	Associate	Datacalc Technology Ind. Corp	$4495.00	114 function keys
B.E.S.T	8088	64K	Serial or parallel	One DD DS floppy	640 x 325 pixels	Yes	N/A	Multiflex	Exceltronix	$1,995.00	IBM PC compatible
The Big Blue Board	8088 (opt. 8087)	128K; expandable to 256K	Optional card	One slimline 5¼" floppy	640 x 200 pixels	Yes	DOS BIOS in EPROM	Robin Hood Electronics	Robin Hood Electronics	$2495.00 inc. monitor & keyboard	IBM compatible
Canon AS-100	8088	128K	Opt. serial or parallel	Optional 5¼" or 8" floppy or 5" hard	640 x 400 pixels	Optional	2 BASICs	Canon	Office Equipment	$3525.00	Avail. w. colour ink jet printer
Columbia NPC 1600–1	8088	128K	2 serial, 1 parallel	Dual 5¼" floppy	320/640x200 pixels	Yes	2 operating systems Perfect software	Columbia Data	Peripherals Plus	$3399.00	IBM compatible; 10 mb hard disk model $5999.
Copam PC-301	8088	256K	1 parallel, 2 serial	2 floppy	640x200 pixels	Yes	MS-DOS, CP/M-86	Copam Canada	Universal Comp. Sys.	$3495.00	IBM compatible
Corona PC	8088	256K	Serial & parallel	2 DSDD floppy	640x325 pixels	Optional	Multimate 3.26, MS-DOS 2.0	Corona	Scarsdale Computers	$3990.00; hard disk version $5995.00	Can mix text & graphics
DEC Rainbow 100	Z80 & 8088	128K	Serial	1 drive accommodating 2-5¼" disks	800x240 pixels	Palette of 1.024 colours	Choice of CP/M-86 or MS-DOS	Digital Equipment	Local Dealers	$4600.00	
DEC Rainbow 100+	Z80 & 8088	128K	Serial	1 dual-diskette drive 1-10 Mb hard	Optional; 800x240 pixels	Opt., palette of 4,096 colours	CP/M-86 or MS-	Digital Equipment	Local dealers	$7,500.00	
HP 150 Touchscreen	8088	256K	2 serial, 1 IEEE-488	Opt. floppy or hard drives	512x390 pixels	No	MS-DOS, P.A.M.	Hewlett-Packard	NSN Options	$5200.00	
Heath H-100	8088 & 8085	192K	2 serial & 1 parallel	1 DSDD 5¼" floppy	640x225 pixels	Optional	CP/M or ZDOS	Heathkit	Heathkit	$3,300; $3500 w. integrated monitor	Kit version of Zenith Z-100
Heath ET-100	8088	16K	1 serial, 1 programmable parallel	Cassette based; disk upgrade available	33 graphic chars.	Optional upgrade	CP/M assembler, editor & debugger	Heathkit	Heathkit	$2,000.00	Available in kit or assembled form

NEC Advanced Personal Computer	8086	128K	Serial & parallel	1 or 2 8" floppy	640x475 pixels display window	Optional	CP/M & MS-DOS	NEC	Microcomputers of Canada, Inc.	$4195—1 drive; $5195—2 drives	$6395 with colour
Pronto 16/10	80186	128K	1 serial, 1 parallel, 4 expansion ports	2 5¼" floppy	Optional 640x480 pixels	No	BASIC, word processor, spreadsheet, more	Pronto Computers, U.S.A.	Pronto Computers,	$2,995.00	
TI Professional Computer	8088	128K	Serial, 5 expansion ports	1-5¼" floppy	720x300 pixels	Optional	Variable	Texas Instruments	Authorized dealers	$3,445.00	Voice management system available
Televideo TS 1603	8088	128K	Serial	2-5¼" floppy	Optional	No	CP/M-86 and MMM Ost	Televideo	Datamex	$4,420.00	Extensive software available
IBM PC	8088	256K	Expansion slots	One 360K drive	640x200 pixels	Optional	Software in ROM	International Business Machines	Local dealers	$3069.00	Optional auxiliary storage with expansion unit
IBM XT	8088	256K	Async Comm.	1-5¼" floppy, 1-10 Mb hard drive	640x200 pixels	Optional	Software in ROM	International Business Machines	Local Dealers	$6,760.00	
TRS-80 Model 2000	80186	128K	Serial; 4 expansion slots	2 slimline 5¼" floppy	640x400 pixels	Yes	MS-DOS	Tandy	Radio Shack	$4150.00—2 floppy drives; $6399 w. 1 floppy drive & 1 hard drive	Processor operates at 8 MHz
Toshiba T-300	8088	192K; expandable to 512K	1 serial, 1 parallel	1-5¼" DD floppy	640x500 pixels	Yes	MS-DOS and TBASIC	Toshiba	Irwin Electronics, Infinite Canada Inc.	$3,500.00	Programmable function keys
Xerox 16/8 Professional Computer	8086 & Z80A	128K	Serial & parallel	Optional 2 floppy or or 1 hard, 1 floppy	Optional	No	BASIC	Xerox	Xerox Stores	$5595.00 SS drives; $6,795.00 DS drives	$8995.00 w. rigid disk
Zenith Z-100	8088 & 8085	128K	2 serial & 1 parallel	1 DS DD 5¼" floppy	640x225 pixels	Optional	CP/M or ZDOS	Zenith	Local dealers	$4395.00 (no monitor); $5295.00 (2 drives)	$5450.00 w. 2 drives & monitor
Ajile II	8088	256K	Serial & parallel	2-5¼" DS DD floppy	640x250 pixels	No	In:Scribe, Multiplan	Bytec-Comterm	Anderson Jacobson	$3,190.00	Single drive version; $2,730.00
Hyperion	8088	256K	Serial & parallel	2-5¼" DS DD	640x250 pixels	No	In:Scribe, Multiplan	Bytec-Comterm	Computerland	$4,950.00	
Columbia VP	8088	128K	Serial, Parallel & 7 expansion slots	2 half-height 5¼" DS DD	640x200 pixels	No	Perfect series, Fast Graphics	Columbia Data Systems	Peripherals Plus	$2,999.00	
DOT Portable	8088	128K	2 serial	2-3½" SS DD	1056x254 pixels	No	MS-DOS	Computer Devices	Datamex	N/A	Integrated printer
Corona Portable	8088	256K	Serial & parallel; 4 expansion slots	2 DD DD floppy	640x325 pixels	No	MS-DOS 2.0, Multimate 3.26	Corona	Scarsdale	$3,990.00	$5,995.00 for hard disk version

Survey of PC Compatibles

Name	Processor(s)	RAM	Printer I/O	Disk Drives Inc.	Graphics	Colour	Software Inc.	Manufacturer	Available From	Suggested Retail	Other
Kaypro 4 Plus 88	Z80A, 8088	320K	N/A	N/A	Optional	No	Same as Kaypro II	Kaypro	Computron	$3,695.00	
Olivetti M-18 Portable	8088	256K	Serial & parallel	1 half-height 5¼" DS DD	640x325 pixels	No	GW BASIC, Multi-Mate, PC Tutor, MS-DOS	Corona	Olivetti branches & dealers	$3596.00; $3695.00 desktop model; both models $6295 w. 10 Mb hard disk	Shock mounted disk drive
Olivetti M24	8086	256K	Serial & parallel	1 half-height 5¼" floppy	640x400 pixels	Yes	MS-DOS, GW BASIC	Olivetti	Olivetti branches & dealers	$4445.00	IBM compatible; opt. 2nd floppy or 10 Mb hard disk
Olivetti M21 Portable	8086	256K	Serial & parallel	1 half-height 5¼" floppy	640x400 pixels	No	MS-DOS, GW BASIC	Olivetti	Olivetti branches & dealers	N/A	IBM compatible; optional second 5¼" floppy
Nelma Persona 16	8088	Expandable to 512K	1 serial, 1 parallel & optional 2nd serial	2-5¼" DD disk drives	Colour 600x200 pixels, monochrome 720x350 pixels	Optional	MS-DOS	Nelma Data Corp.	Nelma Data Corp.	$3,995.00	Clock w. rechargeable battery backup. IBM software & hardware compatible
The President	8088	128K	1 serial and 1 parallel	2 slimline 5¼" floppy	640x320 pixels	Yes	N/A	President Computer Corp.	President Computer Corp.	$3,195.00	High resolution monochrome monitor included
Sharp PC 5000	8088 & C-MOS	128K	Serial	Opt. 128K bubble cartridge	640x80 pixels	No	N/A	Sharp Electronics	Total Office Systems	$2695.00, not including printer & drive	
Texas Instruments Portable	8088	128K	Serial & parallel	1 half-height 5¼" floppy	720x300 pixels	Optional	MS-DOS	Texas Instruments	Texas Instruments	$3475.00	
North Star Advantage	Z80A; opt. 8088	64K	Serial & parallel	2 floppy or 1 floppy, 1 hard	640x240 pixels	No	CP/M or DOS	North Star	TRW Data Systems	$3695.00 for 2 floppies	Systems with hard drives start at $7,495.00
Olympia People	8086	128K	Serial & parallel	2 floppy drives	600x485 pixels	Optional	WordStar, SuperCalc, dBASE II	Olympia International	Olympia Business Machines Can. Ltd.	$4,950.00	
Sanyo MBC 550/555	8088	128K	Opt. serial	1-160K 5" floppy (550) or 2 (555)	640x200 pixels	Yes	BASIC, MS-DOS	Sanyo	Astris Science Inc.	$1495.00 (550); $1995.00 (555)	W. 360K drives, the 550-2 & 555-2 are $1795.00 & $2495.00 respectively
Sperry Personal Computer	8088	128K	Serial	1 or 2 5¼" floppy or 10 Mb hard	320x200, 320x400, 640x200 or 640x400 pixels	Yes	MS-DOS	Sperry Inc.	Sperry Inc.	$3,970.00	Five configurations available
JLS XT	8088	64K	8 slots	N/A	N/A	N/A	N/A	JLS Electronics	JLS Electronics	$1,499.00	IBM compatible. 130 watt power supply
IBM PCjr	8088	64K; 128K enhanced	Serial	Opt. DS 5¼" floppy 1-320K floppy (enhanced model)	N/A	Yes	Software in ROM	International Business Machines	Local dealers	$998.00 entry level; $1569.00 enhanced	Compatible with over 30 IBM PC programs
IBM Portable	8088	256K	5 expansion slots	2-5¼" DSDD floppy	650x200 pixels	No	Software in ROM	International Business Machines	Local dealers	$4,649.00	
President Sr.	8088	256K	1 serial & 2 parallel	1-10 Mb hard disk & 2-5¼" floppy; 1 DS DD & 1 DS QD	720x348 pixels	No	N/A	President Computer Corp.	President Computer Corp.	$5495.00	Real-time clock/calendar
President Ex.	8088	256K	2 serial & 2 parallel	1-20 Mb hard, 1 1.6 Mb 5¼" floppy 1-360K 5¼" floppy	720x348	Yes	N/A	President Computer Corp.	President Computer Corp.	$7,945.00	256K extra RAM on multi-function card.
Panama XT	8088	64K	1 serial, 1 parallel	1 half-height 5¼" floppy; opt. hard drive	640x320 pixels	Optional	BIOS in ROM	Ogivar Inc.	Ogivar Inc., local dealers	$4,700.00	'Mouse' included
TAVA PC	8088	64K	2 serial, 1 parallel	1-5¼" floppy	640x320 pixels	Yes	N/A	TAVA Corporation	Nielsen Computers	$2,995.00	Monitor included
Eagle PC +I/ PC +II	8088	128K	2 serial, one parallel	1-5¼" floppy; PC2+ II has 2	Opt. card...640x200 pixels	Opt. card	MS-DOS, BASICA	Eagle Computers	DataTech Systems Ltd., Leading Source	$2740.00(PC +I), $3330.00 (PC +II)	Monitor optional

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Hamilton: 72 James St. N. (416) 522-4124

Mail Order and rear pickup counter ($25 min):
335 Evans Ave.
Toronto Ont. M8Z 1K2
(QEW and Kipling)

Mail Orders: (416) 252-5285
only if busy: (416) 921-8941
Long distance order placing: 1-800-268-3798
(Operators on 800 number cannot handle any enquiries other than orders)
Due to expansion, 800 number subject to change

Exceltronix
Components & Computing Inc.

A successful, rapidly expanding all-Canadian company commited to high technology.

Founded in 1979 by Eugen Hutka, the **Exceltronix** group has grown to sales of over $8 million a year with four retail branches, the original (but much expanded) one at 319 College Street in Toronto, 335 Evans Avenue also in Toronto and with Branches in Ottawa and Hamilton.

From a retail store specializing in electronic parts, **Exceltronix** is now only one of a group of companies, all controlled by Eugen Hutka.

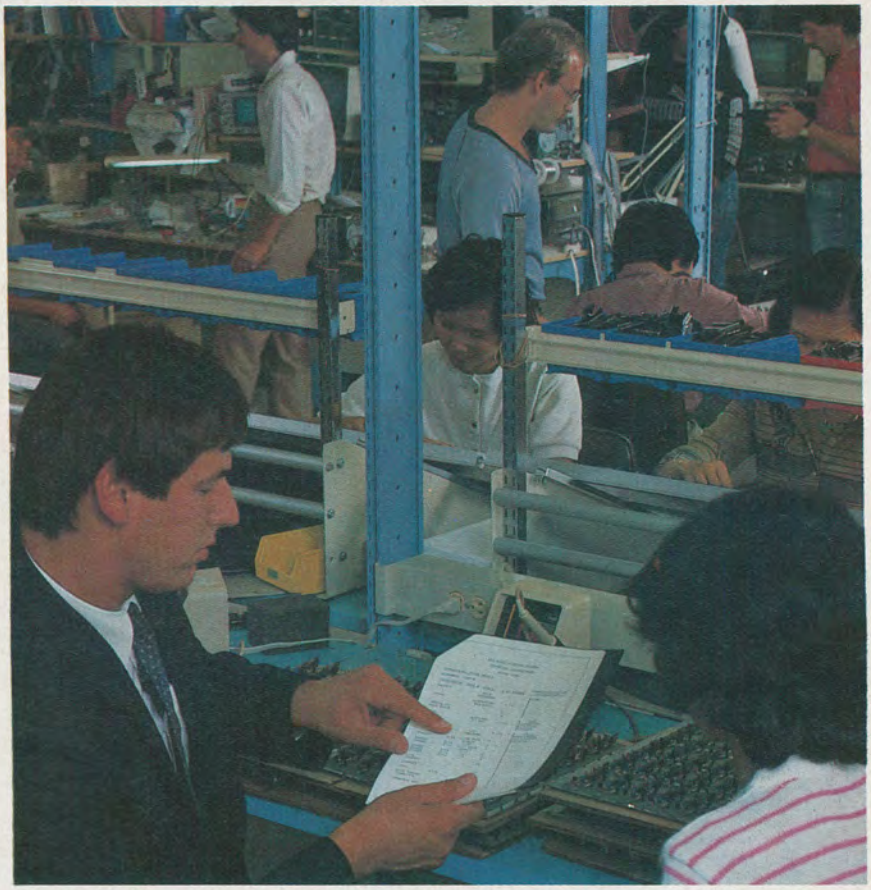
Activities range from original research and development (almost $1 million was devoted solely to this last year), to manufacturing, to retailing and mail order.

Multiflex Inventions and Technologies Inc. are major suppliers to Canadian industry: the advanced message display signs in the Toronto Subway system were designed by **Multiflex** and manufactured by **Versa-Digital Inc.** and similar systems are in use with VIA Rail. **Multiflex** and associated companies do custom design, development and manufacture for all types of customers, including Northern Telecom, CGE and Bombardier.

Despite its phenomenal growth, **Exceltronix** has not forgotten what led to this success: personal service, and competitive prices. The same company who are mass producing IBM and Apple compatible peripheral cards will still sell you a single resistor if that is what you want.

Exceltronix and its sister organizations are proud, expanding, all-Canadian companies.

Associated Companies:
Exceltronix Inc.
Multiflex Inventions and Technologies Inc.
Toronto Computing Centre Inc.
Versa-Digital Technology Inc.
Digi media Inc.



Eugen Hutka still takes an active interest in all aspects of the company's business and is seen here inspecting products on the production line.

The display signs used through the Toronto subway system are products developed and produced by Multiflex and Versa-Digital.

The Hamilton branch of Exceltronix opened in 1984. There is also a similar sized stored in Ottawa.

Almost all products are flow soldered and ultrasonically cleaned in Multiflex's 5,000 square feet production facilities.

Almost $1 million was spent last year by the group on research and development of new products.

Exceltronix
Components & Computing Inc.

Order Form

Mail Orders to Exceltronix, 319 College St., Toronto, Ont., M5T 1S2

We also accept phone orders: (416) 252-5285. If busy (416) 921-8941
Check Electronics Today or Computing Now! Magazines for phone numbers.

All non-certified cheques will be held for 10 working days for clearance before orders are shipped. Ontario residents must add PST unless proper exemption certificates are supplied with order. All prices and specifications subject to change without notice. No returns accepted without prior written consent of Shipping Dept. manager. A 15% restocking charge will be applied to all returned items. Returns will be refused unless prior written RMA# (approval) is obtained from the mail order manager. RMA# must appear on package.

Name _____

Address _____

City _____ Prov _____

Date _____

QTY	Description	Price Each	Total Price

Total for goods (Minimum $10.00) _____
Shipping (Minimum $5 — see below)* _____
Ontario Residents add 7% PST _____
Adjustments _____
Total _____

*Shipping: Minimum $5 which includes handling and insurance. Items are shipped UPS or other suitable carrier. Shipping costs are dependent on weight and destination, if you are unsure contact our Mail Order Department.

Payment: ☐ Cheque ☐ Money Order ☐ Credit Card. Do NOT send cash.

We accept Visa, Mastercard, American Express and Diner's Club Credit Cards

( ) Visa ( ) Mastercard ( ) American Express ( ) Diner's Club

Card No. ..... **Expiry Date** ..... **Signature** .....

All prices are in Canadian funds, FST included

Please feel free to photocopy this order form

Exceltronix

Apple Products

Apple Macintosh Computer only $2860

Features:
- ROM 64K, RAM 128K
- Microprocessor. The 32-bit Motorola MC68000 microprocessor.
- Disk Drive. Built-in 3½" disk drive, which can store 400K per disk.
- Mouse. Features: one button, a rotating ball and optical sensors to translate movements of the mouse to Macintosh's screen pointer with pin-point accuracy.
- Display. Nine inch, high-resolution (512 x 342 pixel) bit mapped display. Green screen.
- Polyphonic sound port.
- Optional 3" drives will be available from Multiflex Tech. Inc. at unbeatably low prices.
- Keyboard and Mouse.

Printer I/O:	Serial
Screen Format:	Variable
Sound	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	Graphics and word processing
Weight:	17 lbs.
Primary Market:	Home, business education.

MacPackage = Mac as described above plus:

- Macwrite
- Macpaint
- System Disk
- Manuals

With Imagewriter $3,795.00

Mac Accessories

Mac Numeric Keypad	$235.00
Mac Disk Drive	$655.00
Mac Carry'n'case	$170.00
Mac Surge Suppressor	$130.00
Mac Disks	$62.00
Mac Star interface for Star Micronics	$CALL

Mac Packages

128K Macintosh printer/external drive	$4299.00
512K Mac System	$5,599.00
Macintosh 128K only	$2860.00
Printer	$849.00

Software for Mac

The Main Street Filer: Mailing list — job costing — inventory control — sales reports — all in one	$365.00
Basic	$149.00
Multiplan	$189.00
Chart	$149.00
MacWrite/MacPaint	$221.00
Pfs File & Pfs Report	$214.00
Think Tank	$150.00
Habadex	$212.00

Apple //c

$1,569.00

Operating System:	BASIC
Processors:	65C02
RAM:	128K
Printer I/O	Serial
Disk Drives Inc:	One SSSD 5¼" floppy
Screen Format:	40/80 x 24
Graphics:	280/560 x 192 pixels
Sound:	Yes; volume control and headphone jack
Colour:	Yes
Keyboard:	Integrated
Software Included:	Four disk introduction system utilities
Weight:	3.4 kilograms
Other:	No slots. Ports for printer, second drive, modem, RGB monitor or television, composite monitor, mouse or joystick/ paddles.

- Built-in disk drive.
- 80 Column
- Full size, full featured keyboard.
- Six program computer course
- Learning manuals (monitor is not included) $1,569.00

Apple Disk Drive	$479.00
Apple Mouse & Software	$165.00
Apple Mini monitor	$324.00
Apple monitor stand	$60.00
Apple Carry'n'case	$60.00
Hayes Joystick	$64.00
Granny Smith (printer interface) for Epson & Gemini style printers	$180.00

Apple //e . . $1,229.00

Operating System:	BASIC
Processor(s):	6502A
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional
Screen Formats:	40 x 24; optional 80 x 24
Graphics:	280/560 x 192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC

Features:
- upgraded version of Apple //

Standard Package Includes:
- full upper and lower case keyboard
- high resolution graphics
- wide software and hardware support
- built-in self tests
- 64K of RAM
- compatible to Apple// + , PLUS many more improvements $1,229.00

Apple Mouse & Software	$146.00
Apple Numeric Keypad	$235.00
Apple 128K extended card	$208.00
Hayes Joystick	$64.00
80 Column	$149.00
Multiflex IPI	$69.00
Multiflex disk drive	$245.00
Apple Disk Drives	$439.00

Check page 6 for gigantic selection of Apple peripherals.

Check page 13 for printers.

Check page 14 for monitors.

Service Policy — *ask us for our one year extended warranty plans.*

Apple //e Package Deal $1,659.00

- Apple //e
- Multiflex Disk Drive & Controller
- 80 Column Card
- Multiflex Z80 Card (CP/M software not included)

Compatible Products

Exceltronix Super 6502 System: EXCEL2 . . . $599.00

We strongly believe that our 6502 system will efficiently serve all of your needs; all of the options are on one board. Excel2 far surpasses many of the other 6502 systems.
Features:

- attractive case
- heavy duty power supply
- superior high quality professional keyboard with upper and lower case, and numeric key pad
- 80 x 24 video, with soft switch on board
- 64K of RAM on board
- 2 Drive Floppy controller on board
- Five additional expansion slots
- Fully assembled and tested, 90 day limited warranty
- **(System comes with blank EPROMS on board; does not include any propritary boot software or Basic)**
- Systems are professionally assembled and tested (boards are wave/flow soldered and ultrasonically cleaned.).

EXCEL 2 Package . . $889.00 Includes:

- 6502 system as described above
- Multiflex Apple TM Compatible Disk Drive
- Z80 Board (CP/M software not included)

Apple and Applesoft are trade marks of Apple Computer Canada

APPLE COMPATIBLE DISK DRIVES

FAMOUS MULTIFLEX DISK DRIVE

$239.00

One Year Warranty

Features:
• Apple compatible • Attractively packaged • Professionally built and tested • Canadian Made • 1 year warranty • We believe that Multiflex put out more drives in the last year than all other Canadian manufacturers combined.

PACKAGE DEAL #1 Includes:

Multiflex disk drive (as described) and multifles floppy disk controller **$289.00**

PACKAGE DEAL #2 Includes:

Two multiflex disk drives and multiflex floppy disk controller **$520.00**

SLIMLINE DISK DRIVE $229.00

Attractively packaged, Apple compatible, ultra reliable (120 day warranty).

EXCEL 6 Package . . $995.00

Features include:

- our super 6502 system (same board, with same features, as used and described in the EXCEL2 package, BUT:
- comes with new attractive case (as seen in picture)
- IBM compatible extra high quality serial keyboard
- Multiflex serial to parallel programmable ASCII converter card
- Extra heavy duty power supply, with RFI filter and power light indicator built into the power switch.
- Special silent 3" Fan is built in, to keep your system cool.
- one Apple compatible built-in disk drive, which leaves enough space for an optional hard disk drive or another floppy drive.
- Blank EPROMS **included, but does not include** any proprietary Boot software or Basic.
- Monitor not **included in price.**

EXCEL 6 Package WITH TWO APPLE COMPATIBLE FLOPPY DISK DRIVES $1,199.00

EXCEL 6 Ultra Loaded Package . . . . . $1,799.00 DON'T MISS THIS OFFER!

TOP VALUE

- EXCEL 6 system
- 2 built-in drives (Apple compatible)
- complete Z80 Card (CP/M software not included)
- Multiflex Parallel Printer Card and Cable
- Star Gemini 10X Printer
- Zenith or Amdek 12" green screen or amber monitor, with video cable

MULTIFLEX APPLE COMPATIBLE MODEM

300 Baud direct connect, autodial, autoanswer modem, which plugs right into your Apple or compatible computer and work like a charm.

$169.00 **SUPER SPECIAL**

Exceltronix

Apple Compatible Peripherals

MULTIFLEX NEW SUPER 80 X 24 VIDEO CARD WITH SOFTSWITCH $85.00

This new Multiflex card features: • superb 80 columns by 24 lines display, with upper and lower case, reverse video • includes built-in soft switch, allowing you to switch between the Apple's 40 column and the video cards 80 column from the keyboard. • superb compatibility.

MULTIFLEX 16K RAM CARD $57.95

Expand your 48K Apple II + to 64K. The Multiflex 16K Ram Card allows other languages to be loaded into your Apple from disk or tape.

WIZARD 16K RAM CARD $89.00

Same functions as Multiflex 16K Ram Card

MULTIFLEX 128K MEMORY CARD . . $185.00

(with 128K of RAM on board)
With 64K of RAM on board $129.00
(software not included)

128K Card can be used to function as RAM disk with your Apple.

MULTIFLEX UPGRADED Z80 CARD $57.00

This card allows the user to run Z80/8080 programs on his Apple II + or IIe computer. Specifically, it allows him to run the CP/M operating system with all its attendant software such as word processors, accounting packages, etc. (CP/M software not included).

MULTIFLEX Z80-64K CARD

This spectacular card provides you with the functions of a Z80 card along with giving you extra 64K of self contained memory, on top of the existing memory in your Apple computer. (Software not included)

$179.00

MULTIFLEX PARALLEL PRINTER INTERFACE CARD WITH CABLE

This card plugs into any of the Apple II + , IIe, or work-alike computers, and provides the user with a parallel interface capable of handling graphics and characters. Ideal for use with the Star Gemini and Epson Printers.

BEST SELLER **$65.00**

WIZARD IPI INTERFACE $85.00

MICROTEK APPLE DUMPLING PARALLEL CARD $135.00

Similar functions as Multiflex Parallel Printer Interface Card with Cable.

WIZARD BUFFERED PARALLEL INTERFACE CARD

BPO 16 . . . . . $189.00
BPO 32 . . . . . $239.00

MULTIFLEX SUPER SERIAL CARD $77.00

This card allows you to: • select desired baud rat·. • connect to a serial RS-232 modem, terminal, or a serial printer port • for example, connect two Apple computers (using this card) to communicate with each other, through the RS-232 link over hundreds of feet.

MULTIFLEX FLOPPY CONTROLLER FOR 8" DRIVES $99.00

This card plugs into the Apple computer and allow you to use 8" DS DD Disk Drives. (Software not included).

Cable $25.00

SUPER SPECIAL
MULTIFLEX FLOPPY CONTROLLER $59.00

Features:
• plugs right into slot #6 in your Apple computer
• capable of handling up to two Apple compatible drives.

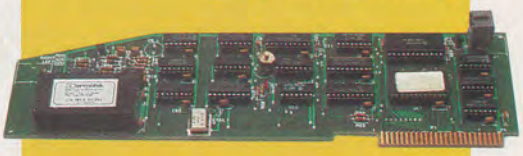
MICROTEK SERIAL CARD FOR THE APPLE . . $139.00

Similar functions to MULTIFLEX super serial card.

MULTIFLEX EPROM PROGRAMMER $69.00

Features:
• Eprom programmer for Apple computers • Programs 2716, 2732, 2732A, 2764 • ZIF socket for the EPROM • Complete with software • Comes with a built-in programming voltage supply.
Included with the card is a disk full of software, which using menus allows the user to program or verify EPROMS, check if they are blank, set pointers anywhere in memory, and save or load memory ranges to/from the disk drive, making this unit a very versatile piece of hardware for the hardware developer or hobbyist.

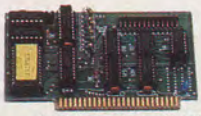
MULTIFLEX APPLE COMPATIBLE MODEM SUPER SPECIAL



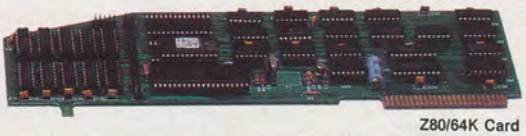
300 Baud direct connect, autodial, autoanswer modem, which plugs right into your apple or compatible computer and work like a charm.

$169.00 **TOP VALUE**

128K RAM Card



Parallel Printer Card

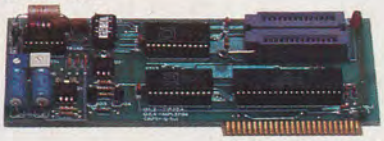


Z80/64K Card

16K RAM Card

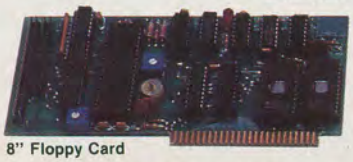
80 x 24 Card

Serial Card

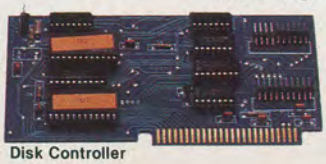


EPROM Programmer

Z80 Card



8" Floppy Card



Disk Controller

All of our peripheral boards are professionally built, cleaned and tested, with a 90 Day Limited Warranty.

Software and Books

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We believe we have the best prices, check our monthly ads for super specials!

Features
Lotus 1-2-3 . . . . $429.00
WordStar Professional . . $539.00
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MultiMate $449.00
Symphony $650.00

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BPI Accounting . . . . . $CALL
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dBase II $599.00
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PFS Graph $129.00

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Visigraph $279.00
VisiMouse $399.00
VisiWord $409.00
VisiCalc $279.00
Visitrend/plot $339.00
Visischedule $339.00

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Supercalc 3 . . . . . $379.

Entertainment Adventure/Arcade/Skill
Ultima III (AD) $74.00
Lode Runner (ARC) $36.00
Donkey Kong (ARC) $36.00
Sargon III (SK) $52.00
Frogger (ARC) $39.00
Zork I (ADV) $43.00
Zork II (ADV) $43.00
Zork III (ADV) $43.00
Millionaire/Tycoon (SK) . . $CALL
PacMan (ARC) $41.00
Deadline (ADV) $51.00
Apple Panic (ARC) $36.00
Serpentine (ARC) $39.00
Genesis (SK) $36.00
Temple of Apshai (ADV) . . $39.00
Witness $51.00
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Flight Simulator $59.00
Ultima II $62.00

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Mastertype $59.00
Game Show $44.00
Wizard of Words $44.00
Face Maker $40.00

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How to use Wordstar (volume 1 & 2) $78.00
How to use MultiMate (volume 1 & 2) $78.00
How to use Microsoft Word $78.00

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CP/M-86 . . . . . $60.00
PL/1-86 . . . . . $759.00
PC DOS $84.00

Lotus Development
Lotus 1-2-3 (Version 1A) . . $429.00
Symphony $650.00
Symphony Upgrade $345.00

Micropro
Wordstar w/tutorial on disk (version 3.3) $539.00
Wordstar/MailMerge/CorrectStar/ Starindex (ProPack) . . . $649.00
Infostar Plus (version 1.6) Includes Star Burst . . . $680.00
Bank St. Writer $80.00

Microsoft
C-Compiler $520.00
Flight Simulator $59.00
Multiplan (new version) . . $199.00
Multitool Word . . . . . $CALL
Multitool word w/mouse . . $CALL
Pascal Compiler . . . . . $CALL
Microsoft Word (ver. 1.1) . $389.00
Microsoft Word w/mouse (ver.1.1) $519.00

Microstuf
Crosstalk XVI (for Hayes Smart-Modem) $186.00

Multimate International
Multimate w/80K word speller — An advanced word processor with all the features of a dedicated stand-alone system. Softword Systems MultiMate (ver. 3.22 w/spell checker & tutorial) $449.00

Software Publishing
PFS/File $129.00
PFS/Graph $129.00
PFS/Write $129.00
PFS/Report $129.00
PFS/Access — The first of a series of PFS telecommunications products. Works with the following modems: Hayes Smartmodem 300, 1200, 1200B; Novation 103 and 103/212 Smart-Cat; Transend PC Modem Card; US Robotics Password; Ven-Tel PC MOdem Plus & others. $115.00

SSI
Word Perfect with speller . $CALL

Apple Software

Word Processing
Bank Street Writer $68.00
Magic Window II $149.00
Wordstar w/free CP/M card $425.00
Screenwriter 11 . . . . . $99.00
Applewriter //e $217.00
Magicalc $149.00
Appleworks $299.00

Spreadsheet
Visicalc 3.3 . . . . . $149.00
Multiplan $199.00
Supercalc III $379.00

Database
PFS file/report/graph $128.00
dBase II $459.00
dB Master $279.00

Utility/Business
Locksmith 5.0 . . . . . $117.00
Quick code $289.00
Sensible Speller $125.00
Home Accountant $79.00
Bag of Tricks $46.00
Apple Mechanic $32.00
Copy II Plus Utility $48.95
Micrsoft Applesoft compiler $199.00

Beagle Bros.
DOS Boss $32.00
Alpha Plot $45.00
Frame Up $35.00
Disk Quick $33.00
Type Faces $23.00
Beneath Apple DOS $25.00

Games
Choplifter $34.00
Temple of Apshai $34.00
Sargon III $48.00
Zork I, II, III $34.00
Ultima II, III $54.00
Flight Simulator II $49.00
Chess — Odesta $86.00
Koala Pad $129.00
Wizardry III $59.00
Wizardry I $52.00
Wizardry II 38.00
Lode Runner $40.00
Zaxxon $45.00
Music Construction Set . . $48.00
Pinball Contruction Set . . . $48.00
BC Quest For Tires $48.00
Castle Wolfenstein $32.95
Beyond Castle Wolfenstein $36.95
Suspended $52.00

Educational
Gertrude's Secrets $43.00
Terrapin Logo $129.00
Master Type $34.00
Spellicopter $48.95
Creature Creator $48.95
Rocky's Books $52.00
Mockingboard & speech chip $310.00
Mockingboard only $165.00
Speech chip only $165.00
Typing Tutor II $26.95
Fortran 80 compiler $199.00
Visiterm $109.00
ASCII Express $155.00

Books

Top Apple Books

Apple II User's Guide $22.95
Apple II Circuit Description $31.50
Creative Apple $19.95
Basic Apple BASIC $17.95
Apple Almanac $23.95
Using 6502 Assembly Language $23.95
Apple Logo $22.95
DOS Manuals $24.00
Apple Software '84 . . . . . $23.95
Blue Book $29.00
Beneath Apple DOS $25.95
Apple II Programmers Handbook $22.95
Visicalc Book — Apple ed. $18.95
Apple Fortran $28.00
6502 Assembly Language Programming $24.95
What's Where In the Apple $32.95
Apple Connection $18.95
Kid's and the Apple $26.00
P. Source $32.50
Nibble Express III $23.95
Games Apple's Play $19.95
Elementary Apple $19.95
Apple //e Programmers Reference Guide . . . . . $CALL
Introducing the Apple //c . $CALL
Microsoft Word Made easy — Mac ed. . . . . $CALL
6502 Programming $19.95
Advanced 6502 Programming $19.95
6502 Applications $19.95
Apple Logo $24.95
Discovering Apple Logo . . $20.95

Top IBM Books

The IBM PC-DOS Handbook $23.95
Your IBM Personal Computer $24.50
IBM PC & XT Owner's Manual $19.95
Learning IBM BASIC $22.95
IBM Programs for Business $26.95
Assembler for the IBM & XT $23.95
PC DOS User's Manual . . . $18.95
IBM BASIC $22.95
IBM PC Assembly Language $26.00
Visicalc Book — IBM ed . . $22.95
1.2.3. Go $19.95
Using 1.2.3 . . . . . $22.95
All About 1.2.3. . . . . $13.95
Accounts Basic Programs for the IBM PC $19.95
Interfacing to the IBM $22.95
8087 — Applications & Programming for the IBM $26.00
Assembly Language Programming . . . . . $CALL
Best Book of Lotus 1-2-3 . . $19.95
IBM (CP/M-86 Users Guide) $29.95
Essential PC-DOS . . . . . $CALL
Complete Guide to Multimate $CALL
Mastering Appleworks . . . $CALL
Introduction to Infostar . . $CALL
MS DOS Users Guide $21.95
PC DOS Users Guide $23.95
1-2-3 For Business $22.95
IBM Software 1984 . . . . . $26.95

See Spectacular Business Software Package on Page 12

All prices subject to change

Exceltronix

IBM Computers

For quantity or package deals, contact Exceltronix for unbeatable pricing.

IBM PC — $2,995.00

Includes

- 256K RAM
- 40KB – ROM, self test
- One 369 KB diskette drive
- High Speed 16 bit microprocessor, (8088).
- Operating system 2.10, UCSD P-System & CP/M 86.
- Floppy controller
- Keyboard
- Five expansion slots

IBM XT — $6,195.00

Includes

- (1) IBM 10 Meg Hard Drive
- (1) IBM 360 KB Disk Drive
- Async adapter & Keyboard
- 128KB RAM
- 40KB ROM
- 8 expansion slots
- IBM DOS 2.10

IBM Personal Computer AT System

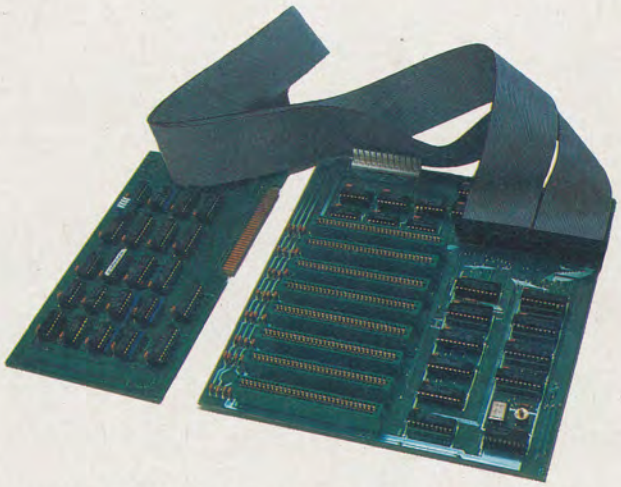
	$5,895.00 Base model	$8,595.00 Enhanced model
Microprocessor	16/24-bit Intel 80286	16/24-bit Intel 80286
Permanent memory (ROM)	64KB	64KB
User memory (RAM)	256KB standard; expandable to 3MB	512KB standard; expandable to 3MB
Auxiliary storage	1.2MB standard (one 1.2MB diskette drive); expandable to 41.2MB	21.2MB standard (one 1.2MB diskette drive, one 20MB fixed disk drive); expandable to 41.2MB
System expansion	8 expansion slots; 1 occupied by standard Fixed Drive/Diskette Drive Adapter	8 expansion slots; 2 occupied by standard Fixed Disk Drive/ Diskette Drive Adapter and Serial/Parallel Adapter
Operating system	IBM Disk Operating System (DOS) 3.00	IBM Disk Operating System (DOS) 3.00

IBM Monitor $429.00
IBM Mono Card $389.00

BEST EXPANSION SYSTEM

The BEST expansion system consists of two boards, the extender card and the receiver/host card. The receiver/host card is mounted in a new chassis with a 150W power supply and room for 4 slimline 10M harddisks.

The **extender** card resides in your host IBM machine. The purpose of this card is to buffer the system bus for transmission along a 62 wire cable to the host card. The host card then receives the signals and regenerates the bus. The extender card also has onboard diagnostic hardware which is activated on each power up to ensure integrity of the expansion system.



The **host/receiver** card resides in a new chassis external to your IBM machine. This board receives signals sent by the extender card and regenerates the standard IBM bus. The host board provides another 8 slots on the bus for greater expansion than a single IBM machine could give. The host board is powered by a powerful 150W power supply independent of your host machine, thus providing enough power for additional disk drives or expansion boards.

NOTE: The housing of this expansion system consists of the same attractive case as used on the BEST computer system, and it may be operated up to several feet away from the main system.

Complete with power supply, boards and cables **$499.00**

Dealer pricing available

See page 12 for the BEST 300/1200 auto dial/auto answer modem . $399

Exceltronix can offer you a complete turnkey package service to suit your needs with excellent background in both software and hardware and with the best service contracts available.

The "BEST" Compatible Microcomputer

$1795
Not a kit — a complete system

See the Review in March 1984 Computing Now!

This prices includes:

- **64K of RAM with presocketed provision for 256K**
- **One disk drive. SA455. Double Sided. Double Density**
- **Colour Video Board**
- **Floppy controller capable of handling up to four DSDD 5¼" disk drives and socketed for optional serial port and real time clock**
- **Monitor not included.**
- **64K RAM upgrade kits for extra memory $69.00**

Full 120 day Warranty

OR The Loaded "BEST"
Everything in our $1795 System plus:
- **Two DS. DD 5¼" Disk Drives**
- **On-board 256K of RAM**
- **RS232 Port**

$2395

OR 10 Meg Hard Disk Version
Everything in our $1795 system plus:
- **10 Meg Hard Disk Drive & Controller**
- **On-board 256K of RAM**
- **RS232 Port**

$3895

The BEST is a compatible microcomputer featuring the following: 8088 processor running at 4.77 MHz for fast service. (Room for the optional new co-processors, the most popular being the 8087 "number crunching" processor)

- 64K RAM expandable up to 256K in blocks of 64K and with the new high density RAMs, there is enough room onboard to hold 1 Megabyte of data in blocks of 256K.
- 5 expansion slots each being identical, so the user can upgrade his machine with IBM compatible hardware.
- D.M.A. controller. Three of the DMA channels are available to the user.
- A timer/counter. This is used by the system for time of day clock; tone generation of the speaker; and a time base.
- An 8 level interrupt controller, 6 of which are bussed to the expansion slots for feature cards. The other two are used for the time of day clock, and the keyboard circuits. (There is also a NMI which is not user accessable since it is used for parity checks)
- Three ROM sockets are available to the user, one generally holds the system BIOS, and the other two can hold any firmware the user wishes to implement.
- A speaker with ½ W of driving power is available to user software which can also control the frequency of oscillation. In fact 3 methods exist to modulate the speakers output: 1) direct control or the output bit stream. 2) output from the programmable timer. 3) the timer clock can be modulated with a program controlled I/O register bit.
- A keyboard interface which is compatible with all IBM compatible keyboards through a 5 pin DIN connector.

OPTIONAL FEATURES FOR THE BEST

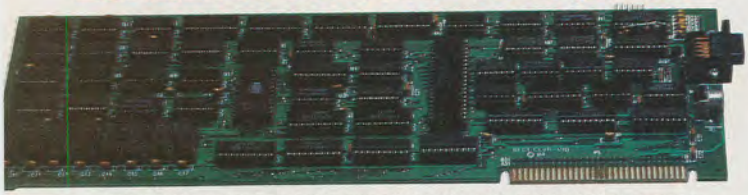
Because the standard BEST system comes with a 5¼" floppy DS, DD, disk drive it was felt that need for the cassette interface would dwindle, thus, to keep costs down the cassette has been designated as an option.

The cassette option requires that the user supply his own good quality cassette recorder and the system board communicates through either the microphone or auxiliary input. The data rate is between 1000 and 2000 bits per second depending on the bit stream sent to the recorder.

Exceltronix

IBM Compatible Boards

COLOUR GRAPHICS VIDEO BOARD. $199.00



This board was designed to be compatible with a wide variety of display systems. Two types of output connectors are provided: 1) composite baseband video 2) direct RGB drive (9 pin D-shell Connector). In addition a light pen port is provided. It must be stressed that this card can be used in black and white with comparable resolution to that of the black and white board. Thus a low cost black and white monitor could be used in place of the more expensive colour monitor without loss of performance (of course colour cannot be achieved on a black and white monitor).

There are 4 modes of supported operation (more are available but the user must write his own software): low resolution graphics, high resolution graphics, low resolution alphanumerics, and high resolution alphanumerics. In the low resolution modes colour is available in a variety of foreground/ background/overscan colours. In high res. there is only black and white available, this is due to the video memory limitation.

GRAPHICS

LOW RESOLUTION:

In low res. graphics the screen is memory mapped into 320 PELS by 200 rows. Each PEL may have one of four colours. The background colour may be one of 16 possible colours the other three may be one of two selectable palettes, namely green/red/brown or cyan/magenta/white.

HIGH RESOLUTION:

In this mode all of the memory is mapped to the screen, thus only black and white is available. In high res. there are 640 PELS by 200 rows, twice that of low res.

ALPHANUMERICS

In both low and high res. alphanumeric mode the characters are generated via an eprom, thus special characters are easily implemented. In addition, it is possible for the user to specify the location of his own eprom external to the video board and be able to utilize both eproms for character generation.

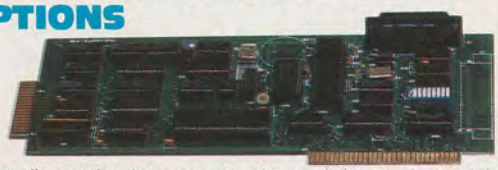
LOW RESOLUTION:

Low res. is characterized by 40 columns by 25 rows of characters. Each character is composed of an 8x8 dot matrix. The characters are enclosed in a 7x7 matrix within this box, with 1 line for descenders. Sixteen foreground colours are supported and 8 background colours are available. In addition, blinking of individual characters is also available.

HIGH RESOLUTION:

High res. supports the standard 80x25 character matrix for high bandwidth monitors. Because all of the memory is used to display characters, colour is not available, however high res. supports the following on a per character basis: reverse video, blinking and highlighting.

FLOPPY CONTROLLER BOARD AND OPTIONS



This board actually contains three separate units, one being standard and the other two being options. The standard unit is the floppy controller card. The options being the asynchronous serial interface and the other being a real time clock with battery backup.

FLOPPY DISK CONTROLLER:. . . . . $159.

This controller can control four 5¼" floppy disks. Two disks are controlled by an internal daisychained ribbon cable, the other two are connected externally through the back pannel via a connector. The controller is based on the NEC Upd 765 or Intel 8272 chip and can control double density/double sided floppy disks, thus giving a formatted capacity of about 320K bytes per drive. The card uses the main boards interrupt and DMA capabilities to improve performance. The board also features write precompensation and digital phase lock loops for "solid" reliability.

ASYNCHRONOUS COMMUNICATIONS OPTION. . . . . $39.

Communication is achieved through one of two means: standard RS232 protocol or though a 20mA current loop.

The transmission speed is programmable from 50 to 9600 baud, with 5,6,7, or 8 bits per character and 1,1½, or 2 stop bits, any combination is supported. The system is based on the INS8250 chip which also provides the following features in addition to those above:

- full double buffering, eliminating expensive, precise synchronization.
- full modem control functions: CTS, RTS, DSR, DTR, and RI.
- false start bit detection.
- line break generation and detection.

This card interfaces easily to any one of the popular modems as well as being able to fully exploit the capabilities of the 'smart' modems.

REAL TIME CLOCK:. . . . . $39.

This option is based on the MM58274 CMOS chip, thus better backup is easily implemented, this allows continuous time keeping even when the machine is powered down. (Includes real time software).

FLOPPY BOARD including both options above (real time software included) . . . $199.

(No cables included)

EPROM PROGRAMMER

External Card.

This card can program any one of the following eproms: 2716, 2732, 2732a, 2764, and the new 27128s. Two sockets are available on the adaptor board, one for the 28 pin eproms the other for the 24 pins eproms. These sockets are standard sockets, however as an option ZIF sockets will be inserted. (We recommend ZIF sockets if large number of eproms will be programmed). Also as an option an extension board is available, this board attaches to the adaptor via a ribbon cable and extends out the back panel. This is to allow eproms to be programmed without removing the cabinet cover every time programming is to be performed. Also as a standard feature, the source software is supplied to allow users to modify the programme to suit their needs.

As an option a serial port can be included on the card; this serial port has the same features as the port described with the floppy disk controller (see the floppy disk description for documentation of the serial port).

MAIN EPROM PROGRAMMER CARD (WITH SOFTWARE)

With 2 standard EPROM sockets $99.00

EPROM PROGRAMMER WITH ZIF SOCKETS (WITH SOFTWARE)

With one 24-pin SIF socket and one 28-pin ZIF socket with provision for serial port. $139.00

EXTERNAL CARD

Ready to plug into the main EPROM Card (includes one 24-pin and one 28-pin ZIF socket and cable). Saves you from opening the computer each time you want to program your EPROMS. $69.00

SERIAL OPTION

For your main EPROM programmer. Provides you with a second RS232 serial port. $49

PARALLEL/ GAMES PORT

$79.00

(cables extra)

This low cost board allows any IBM compatible printer to be connected to the system. The printer signals are through a DB25 connector and can be connected to many parallel Ideal Printers — Gemini, Epson, TTX printers. This card is not only for printers, but can be used where parallel data must be transmitted from the system. It has 12 TTL output lines which can be written and read under program control. Usually 8 are used for data and the others are used for handshaking with the external device. There is also an interrupt line, which the external hardware can 'tickle' for prompt immediate service. (Such applications as real time data acquisition).

The game port allows 4 paddles or two joysticks to be connected to the system. In fact any variable resistive element could be connected and the software would still give a value proportional to the resistance. This allows industrial applications to be realized easily with existing hardware.

IBM Peripheral Cards

The Best 256K PENTARAM

BEST SELLER

Memory: Capable of adding up to 256K of memory to your existing system. This card allows 4 boundary selection by means of a dip switch (the boundary locations are 256K, 384K, 512K and 640K). For special applications, other boundaries can be preprogrammed at the factory.
Serial Port: Serial port can be configured on MS DOS standard COM1 or COM2. (For more details, read about the assynchronous communication option on floppy disk controller board on page
Parallel Port: Supports one of two standard MS DOS printer ports LPT 2 or LPT 3 which are dip switch selectable. (For more information see the description of the parallel game/port card on page
Game Port: The game port allows 4 paddles or two joysticks to be connected to the system. In fact any variable resistive element could be connected and the software would still give a value proportional to the resistance. This allows industrial applications to be realized easily with existing hardware.
Clock/Calendar Real Time Clock: This option is based on the MM58274 CMOS chip, thus battery backup is easily implemented, this allows continuous time keeping even when the machine is powered down. (Battery back-up and real time software are included).

256K PENTARAM package with all the options cost only $499.00

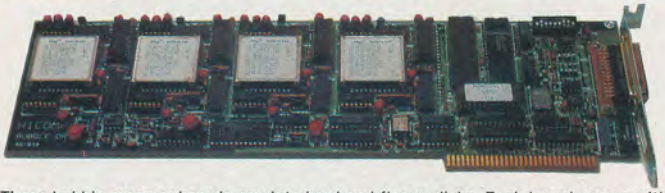
128K PENTARAM package with all the options 359.00

64K PENTARAM package with all the options $299.00

This is a high quality professional "Best" card at affordable prices — a hard to beat deal!

NOTE: this product comes with a 6 month warranty. However, warranty is void if anytampering is done with the board.

BUBBLE MEMORY BOARD $2,295.00



These bubble memory boards emulate hard and floppy disks. Each board comes with 512Kb of memory and can be assigned as disk A,B,C,D,E, or F. Also the bubble memory can be configured so that the system can boot from the bubble once it has been formatted. Each board of 512Kb is emulated as 2 floppies with 256Kb each or 1 512Kb hard drive. The software that comes with the package allows the user to configure the system as he requires.

There is also a special mode which allows the user to use the bubble memory as a block access memory peripheral.

ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERSION BOARD

The board contains two separate functions:
1) an analog to digital conversion unit
2) a digital to analog conversion unit.

$CALL

The following perts to both functions: both have 12 bit resolution, both have a maximum sampling frequency of 100,000 Hz and both have a hardware queue of 32 samples, i.e., 64 bytes.

The A/D section has 8 inputs which are enabled by the initializing software supplied. If there are 8 inputs being used, then the output stream has 8 interleaved samples. The software suppplied will open a file and put the samples in this file. Note however, that it is not possible to write that file to disk since the access time for a floppy disk is too great.

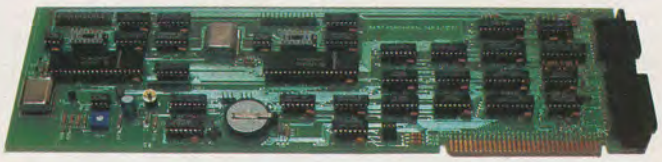
The D/A section has 8 outputs which are again enabled by initializing software. If more than 1 output is used, then the output data must be interleaved (similar to the input). The supplied software will allow the user to specify a file for outputting and the software will take care of the rest.

Note that only the A/D section or the D/A section can be working at the same time.

BEST PROTOTYPING BOARD $28.95

This full length board is a very simple card which allows anyone to design proprietary hardware for his IBM machine. The board is virtually all holes in which to place wirewrap sockets or soldertail sockets. The circuitry provided just decodes the addresses properly so that the board fits into the defined IBM prototyping space. This does not mean that the user is confined to this area alone, since full access is given to the IBM expansion bus.

The Best Quanta Board $189.00



This BEST peripheral board contains four separate functions:

Features:

1) two RS-232 serial ports: COM1 and COM2
2) a printer/parallel port
3) a game port adaptor
4) a real time clock

Without real-time clock $159.00

1. SERIAL PORT

This board contains two RS232-C serial communications ports. Each is individually selectable or de-selectable by a set of jumpers, this allows the user to configure his machine without contention, in case he already has a serial port. The ports are located such that DOS recognizes them as COM1 and COM2: the primary and secondary serial ports respectively.

Each port is RS232 compatible with DTR, DSR, RTS, CTS, CD, and RI fully supported. In addition each port supports the IBM PC mA current loop. The controller is based on the 8250 chip and can support speeds up to 9600 baud.

2. PRINTER/PARALLEL PORT

This port allows any IBM compatible (parallel interface) printer to be connected to the system. The printer signals go through a DB25 connector and can be connected to many parallel printers. This card is not only for printers, but can be used where parallel data must be transmitted from the system. It has 12 TTL output lines which can be written and read under program control. Usually 8 are used for data and the others are used for handshaking with the external device. There is also an interrupt line which the external hardware can 'tickle' for promp immediate service. (For such applications as real time data acquisition).

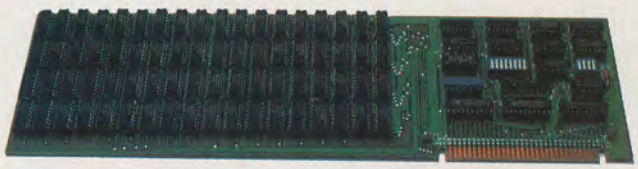
3. GAME PORT

The game port allows four paddles or two joysticks to be connected to the system. In fact any variable resistive element could be connected and the software would still give a value proportional to the resistance. This allows industrial applications to be realized easily with existing hardware.

4. REAL TIME CLOCK/CALENDER

This option is based on the MM58274 chip. It is a CMOS chip, thus battery backup is easily implemented, and allows continuous time keeping even when the machine is powered down. Also included is the software drive and installation manual which incorporates the hardware into DOS.

BEST 512K RAM BOARD



The board provides the user with an impressive half megabyte expansion RAM to be used in conjunction with the RAM already on his main system board. The board has 8 banks of nine 64K RAM chips, 8 bits of data, 1 bit for parity. Each bank is individually selected: this implies that the user need not have continuous memory space but can have a gap of at least 64K. This is important for RAM-DISK users who want to protect their RAM-DISK from reset RAM checks of the bios. In addition the RAMboard can start on the following boundries: 64K, 128K, 192K, and 256K. Thus, if you own an older IBM system with only 64K onboard, you are not excluded from using this board. Also there is a hardware switch which can enable or disable the onboard parity checking generator.

OEM designers please note: the above boundary and bank selection is not fixed since the selection mechanism is in proprietary firmware, and can be easily modified to suit individual needs.

512 Memory Board with 64K of RAM **$189.00**
512 Memory with 128K **$250.00**
512 Memory with 256K **$399.00**
512 Loaded Memory with 512K **$649.00**

Exceltronix

IBM Peripheral Cards

EPROM Emulator

This stand alone product emulates the following EPROMS: 2716, 2732, 2764, 27128. It may be used with any computer which has an RS232 interface.

This product is a must for any hardware development since it allows the user to test and modify EPROM data roughly 20 x faster than with conventional methods.

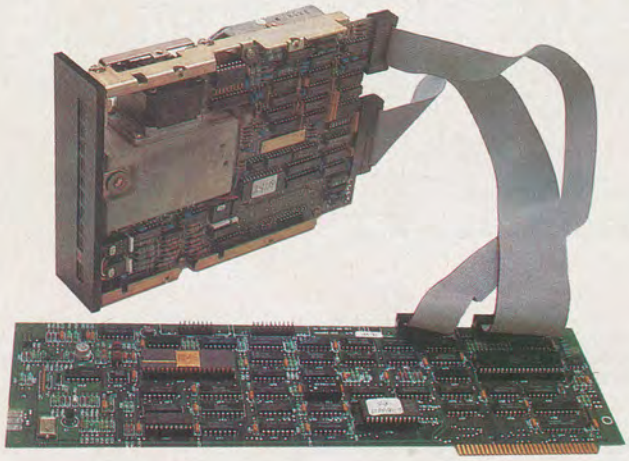
The unit has its own power supply and can be uploaded or downloaded over the RS232 communications link at 300, 1200, 4800 or 9600.

In addition host software comes with it for the IBM PC and documentation concerning the serial data structure is also supplied.

$CALL

Hard Disk Drive

Seagate (industry favoured)
10 MEG. slimline **$989.00**



10 MEG Seagate, slimline drive and hard disk controller. This controller can handle up to two 10 MEG had drives.

Lowest Price of $1,299.00

IBM Compatible Keyboards

(for picture and details, see page 15)

Cherry **$159.00**
Maxiswitch **$159.00**

Cases for your 8088 System

For details see page 22

Standard Sliding top **$65.00**
Hinged top **$74.95**

Power Supplies — see page 20

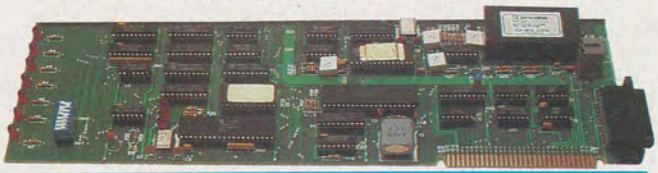
BEST MODEM $399.00

The BEST modem is a smart 1200/300 direct connect modem. It can either be a stand-alone unit in which case it requires a small wall adaptor, or it plugs in one of the IBM slots. When used as a stand-alone unit, the modem looks like a Hayes 1200 Smart Modem, that is, it emulates the same instruction set. When it is used in the IBM, it looks like an intelligent serial communications port which also supports a super-set of the Hayes instruction set.

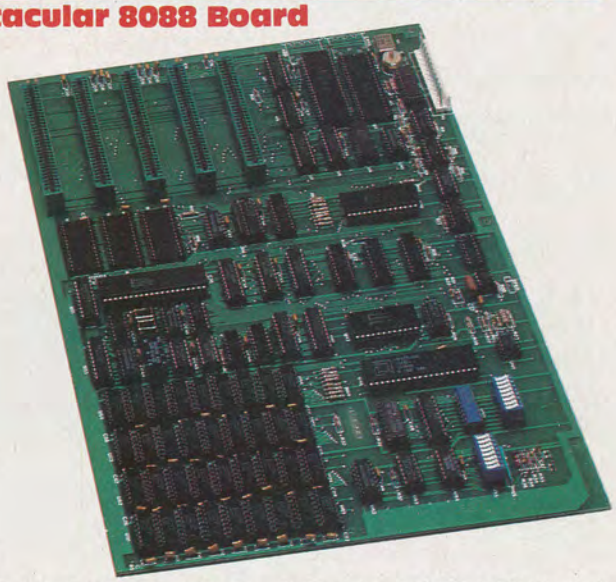
The modem supports auto-dial, auto-answer, and auto-speed select directly from software control. The modem also has a speaker so that aural monitoring of the call is possible. There are also LED monitors so that the state of the modem can always be known. These LEDs are: Modem Ready, Auto-Answer enabled, Carrier Detected, Transmitting, Receiving, Data Set ready.

Software packages such as Crosstalk, PC-talk, and Hayes' Smartcomll also will run with this modem.

A version with 300 Baud only is available, call for best price.



Spectacular 8088 Board



Read BEST System description on page 9. Board does **not** include IBM (Microsoft) BASIC, BIOS or any other proprietary software. Includes one blank 2764 EPROM.

With 64K **$439.00**
8087 Processor optional **$289.00**
64K Upgrade Kits **$69.00**

Award Winning Canadian Accounting Software from Informatic Systems

● Canadian designed and developed ● One of BEST Software for single (MS DOS) & multi users (OASIS) ● Fully integrated and interactive ● No limits on number of records ● BCS Canadian Payroll — best payroll on micro ● BCS Manufacturing — Inventory control and bill of materials, job costing: Integrated on-line with invoicing and AP, allows for fractions of prices & quantities, exact COGS calculation for LIFO/FIFO ● BSC Accounting — GL, AR, AP, Order Entry and Sales Analysis: one of the best GL and Sales Analysis programs ●

Most Competitive pricing available
..... **$CALL**

Printers

Dot Matrix Printers

Exceltronix is now an authorised Star Micronics dealer and repair centre

Star Micronics

1 year warranty
CSA Approved

Gemini 10X ● 120 c.p.s., 100% duty cycle ● 816 characters print buffer, option 4K or 8K ● standard parallel, optional RS232C ● tractor & friction feed ●
$379.00

BEST SELLER

Gemini 15X ● same as Gemini 10X ● 15.5" carriage ●
$599.00

Gemini 10X — Package Deal — Multiflex IPI (ideal for Apple-type computers) and Gemini 10X
$435.00

Delta

10 (10") & 15 (15") carriage ● 160 c.p.s., 100% duty cycle ● 8K print buffer ● serial & parallel standard ● 240 x 144 ultra high resolution ● tractor & friction feed ●

Delta 10 ..... $689.00
Delta 15 ..... $969.00

Radix

10" & 15" ● 200 cps, 100% duty cycle ● 16k buffer ● serial & parallel standard ● proportional & downloadable characters ● 240 x 144 Ultra High Res. ● tractor & fiction...

Radix 10 ..... $ 989.00
Radix 15 ..... $1,139.00

STX-80

● 60 c.p.s. ● 80 columns ● thermal dot matrix ● parallel (centronics compatible) ●

STX-80 ..... $299.00

Star Printer Accessories

Printhead $80.00
Printwheel $18.00
Ribbons $6.50
Paper (500 sheets) (8½x11) $9.95
Paper (2,000 sheets) (8½x11) $32.00
Dust covers $8.50
Printer Stand (plastic) $48.00
Printer Stand (metal) $56.00

Epson

1 year warranty, CSA approved

RX80 ● 100 c.p.s. ● standard, Centronics-style 8 bit parallel optional IEEE 488, RS-232C, etc. ● 10" tractor ●

RX80 ..... $495.00
RX80 F/T (all features as above + friction feed $615.00

FX80 ● 160 c.p.s. ● standard Centronics-style 8 bit parallel ● 10" carriage, tractor and friction ●
$749.00

FX100 ● 160 c.p.s. ● standard, Centronics-style 8 bit parallel ● 15" carriage, tractor & friction
$1,069.00

RX100 ● 100 c.p.s. ● standard Centronics-style 8 bit parallel ● 15" carriage, tractor & friction
$1,189.00

Epson

LQ1500 ● 200 c.p.s. ● NLQ (near letter quality) ● optional: parallel, IEEE-488, RS-232C/current loop ● 15", friction, optional tractor ($79.00) ●
$1,895.00

Panasonic

KX-P1090 ● 90 c.p.s. ● 9x9 matrix ● 10", tractor & friction ● parallel ●
$379.00

Okidata

TOP VALUE

Microline:

83A 120 cps ..... $CALL
92 — 160 cps ..... $CALL
82A — 120 cps ..... $CALL
84 — 200 cps ..... $CALL
93 — 160 cps ..... $CALL

Letter Quality

Teletex TTX

● Daisywheel ● 12 c.p.s. ● parallel & serial interface ● 10-12-15 c.p.i ● friction feed with tractor guide ● **$549.00**

Star-Micronics — Power Type daisywheel printer

SUPER VALUE **$639.00**

Features:
Printer: Static Font impact system
Print Wheel: 96 petal wheel
Print Speed: 18 c.p.s. bi-directional, logic seeking
Paper Slew Speed: 12 l.p.s. @1/6" spacing
Print Buffer: One line
Print Size: 10,12, 15 c.p.i and proportional spacing
Number of Columns: 110,132, 165
Character Sets: over 100 Type fonts available.
Special Features: proportional spacing; dual interface; standard printer mode and word processing mode; 32 easy access format switches reverse paper feed; short form tear-off; cassette ribbon; tractor optional; skip over perforation; 7 or 8 bit selectable interface; self-test
Line Spacing: 3,4,6,8 lines/inch; switch and software selectable
Paper Handling: single sheet: 5.5" to 8.5" wide; sprocket 4" to 13" wide; copies 3 carbonless sheets
Ribbon standard cassette
Interface standard parallel (Centronics compatible) and serial RS232C-20mA current loop
Dimensions 19.6"w x 14.3"d x 5.5"h
Weight 22 pounds

Qume

LP20 ● 20 c.p.s. ● 13" friction, opt. tractor ●
$1,080.00

1140 ● 40 c.p.s. ● 15" friction, opt. tractor ●
$2,580.00

1155 ● 55 c.p.s. ● friction, optional tractor ●
$2,880.00

Smith Corona

(one year warranty)

L1000 ● 12 cps ● 10-12-15 c.p.i. ● serial and parallel ● friction feed, tractor optional ● 13" paper width ● $589.00

D-100 ..... $489.00
D-200 ..... $689.00
D-300 ..... $889.00
L-1000 ..... $589.00
Ultrasonic III Messenger $829.00

Most competitive prices and best service anywhere. Please contact us for quantiy discounts and package deal pricing.

For paper see page 14

Exceltronix

Monitors and Disk Drives

Monitors

Zenith Data Systems

BEST SELLER ZVM 122A ● 12" diagonal screen ● non-glare amber display ● composite input ● 25 lines x 40/80 characters
$139.00

BEST SELLER ZVM 123A ● 12" diagonal screen ● non-glare green display ● composite input ● 25 lines x 40/80 characters
$129.00

CV-2560 ● 25" diagonal screen ● RGB/composite input ● 25 lines x 80 characters ● sound capability ● green screen only switch ● video "loop thru" feature **$1,049.00**

ZVM 124 ● 12" diagonal screen ● non-glare amber display ● PC monochrome input (TTL) ● 25 lines x 80 characters ● 720 x 350 pixels ● IBM PC & compatibles **$229.00**

ZVM 131 ● 13" diagonal screen ● RGB/composite inputs ● 25 lines x 40 characters ● 320 x 240 pixels ● sound capability ● green screen only switch ● video "loop thru" feature **$479.00**

ZVM 133 ● 13" diagonal screen ● RGB input ● 25 lines x 80 characters ● 640 x 240 pixels green screen only switch ● 16 colours including PC brown **$799.00**

ZVM 135 ● 13" diagonal screen ● RGB/composite inputs ● 25 lines x 80 characters ● 640 x 240 pixels ● sound capability ● green screen only switch ● video "loop thru" feature **$839.00**

ZVM 136 ● 13" diagonal screen ● RGB input ● 25 lines x 80 characters ● 640 x 480 pixels ● long persistence phosphors for interlaced applications
FOR BEST PRICE ..... **$CALL**

Kimtron

Model: SCC (RGB .31 mm) precision graphics — 80 column $849.00
: SCB (RGB .39mm) — 80 col. $789.00
: SCA (Composite) $399.00

IBM

IBM Monitor $429.00

Amdek

310A — Amber, 18 MHz $249.00
Colour II Plus RGB — 12 MHz $799.00
Colour III Plus RGB for IBM (13")
80 x 25 character display $399.00
Colour III Plus + //e RGB card
DVM80E, 260(h) x 300(v) line res $495.00

NEW at spectacular prices
Amdek 300 composite ..... $CALL
Amdek 400 RGB ..... $CALL
Amdek 500 RGB + composite ..... $CALL
Amdek 600 RGB ..... $CALL
Amdek 700 Ultra high res. ..... $CALL
Optional tilt swivel for above available.

Roland (14")

CC141 (RGB) ..... $CALL
CB141 (Composite) $469.00

Princeton Graphics

HX-12 RGB hi res. colour $749.00
Max-12 IBM monochrome in amber $359.00
SR-12 hi res. colour $1,285.00
(needs Scan Doubler ..... $369.00)

Drives

Seagate — Best Seller

10 MByte slimline w/controller $1,299.00
10 MByte hard disk only $989.00
See picture on page 12.

Sysgen
II-10 ..... $4,500.00
II-20 ..... $5,600.00
10 & 20 MByte hard disk with cassette backup.

Tallgrass (call for best pricing)
TG-3012 12 MB disk tape $4895.00
TG-3020 20 MB disk tape $5685.00
TG-3/35 35 MB disk tape $7985.00
TG-3170 70 MB disk tape $9985.00
TG-09 IBM hardfile int. ..... $ 189.00
TG-300 DC-300 XL cartridge tape ..... $ 53.00
TG-120 tape head cleaner ..... $ 16.00

IBM
IBM disk drives $419.00

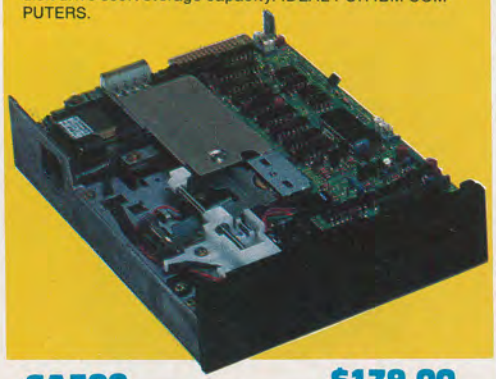
Shugart
SA455 slimline DSDD $239.00

Tandon
Drive $320.00

Disk Drives: BEST SELLER

SA455 ..... $239.00

● Shugart 5¼" slimline double sided double density disk drive 360K storage capacity. IDEAL FOR IBM COMPUTERS.



SA390 **$179.00**

• disk drive mechanism (does not include analog board)• 5¼" single sided disk drive• ideal for use with the APPLE if you make your own analog board.

Shugart 3½" Disk Drive, 400K storage $299.00

Diskettes, Joysticks and other supplies

Maxell

MD1 ..... **$34.00** FD1 ..... **$59.00**
MD2 ..... **$48.00** FD2 ..... **$69.00**

Verbatim

VE1 SS/DD .. **$31.95** 8" SS/DD ... **$55.00**
VE2 DS/DD .. **$43.95** 8" SS/DD ... **$65.00**

BASF

BA1 SS/DD $26.00
BA2 DS/DD $36.00
MAC Disks $60.00

CDC

CDC-1 SS/DD $24.00

Accutrak

AC-1 SS/DD W/plastic case $26.00

Sentinel Multicolour (1 colour 1 Box)

SS/DD ..... **$34.00** DS/DD **$48.00**

Opus

10 Disk + Disk Bank $28.00

Printer Ribbons

Gemini ..... $ 4.50
Panasonic $11.95
Epson FX 80 ..... $11.95
Epson FX 100 ..... $18.95
Qume $10.95

Accessories

Anti Glare Screen $29.95
3M Anti Glare Screen $45.00
Disk Drive Cleaner $19.95
Printwheels from $18.00

Joysticks

Econo $19.95
Computer Joystick $39.95

Hayes — available for II+, IIe, IBM
Mach II $52.95
Mach III $62.95

Kraft — available for Apple, IBM

Deluxe $61.95

TG

Deluxe $64.95

Wico — for Commodore Joystick

Red Ball $44.95

Econo for Commodore

..... $19.95

CH Products

Mach II $52.95
Mach III $62.95

Paddles

Kraft ..... **$58.00** TG **$49.00**

Paper

500 sheets (8½x11") ..... $ 9.95
2000 sheets (8½x11") $32.00

Disk Banks

50 ..... $24.95
100 ..... $CALL

IBM and Apple Accessories

IBM Accessories (for PC & XT)

AST Research
Six Pak plus 64K, upgradeable to 384K, with clock calendar, serial and parallel ports . **$479.00**

Mega Plus II 64K, upgradeable to 256K (or more with MegaPak) with clock calendar and serial port. **$479.00**

Combo plus (64K), upgradeable to 256K, serial and parallel ports & clock calendar **$479.00**

Orchid Technology
Blossom w/64K to 384K . . . . . **$549.**
PC Net Blossom 64K . . . . . **$1165.**

Other local area networks available from **3 Com**

Titan Multi-Function Board for PC
2 serial ports, parallel port, hard disk interface, clock, memory 64K to 576K bytes w/software. . . . . **$CALL**

Apstek
Handi I Plus - Multifunction Board
parallel & serial ports, 384K, clock/calendar w. software **$369.00**

Vista
Maxicard 64K-512K **$399.00**

Attachmate
3270 coaxial interface **$2595.00**

Hercules
Monochrome card **$650.00**
Colour card **$365.00**
Graphics card w. par. port **$589.00**

Tecmar
Graphics Master **$769.00**

Amdek
Mai Video Card . . . . . **$CALL**

Persyst
Video card w. par. port **$469.00**

Quadram
Quadcolour I **$339.00**
Quadcolour II **$689.00**

IBM
IBM Colour card **$359.00**
IBM mono card **$359.00**

Plantronics
Colourplus (par. port) **$539.00**

64K Upgrade kits **$69.00**

Mouse Systems
Mouse w/pop-up menus (requires RS-232) **$269.00**

Keyboards — IBM compatible

Cherry **$159.00**
Maxiswitch **159.00**

Keytronics
5150 (sim. to IBM style kybd) **$285.00**
5151 extended keyboard/ horizontally placed function keys/ separate cursor pad/ separate number pad **$420.00**

Audo Pilot complete voice interface system for use with the IBM PC & XT and compatibles. Your IBM can repsond to voice commands and works with Lotus 1-2-3, VisiCalc, Multiplan, Multimate $759.00

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Modems and Communication Products

Hayes
Smartmodem 300 . . . . . **$356.00**
Smartmodem 1200 . . . . . **$799.00**
Smartmodem 1200B w/SmartcomII **$695.00**
Micromodem IIe **$399.00**

Anchor
Mark VII (AA/AD) **$189.00**
Mark XII (1200 Bd) **$469.00**

Networker
300 baud, direct connect, manual w. software **$179.00**

Multiflex 300B autodial, autoanswer, Apple compatible (see page) . . . . . $CALL

EMP
Auto 1200A **$489.00**
1200 bd. Full auto. compatible, IBM & most PC's. MM101 . . . . . **$79.00**
300 bd. direct connect.

Multiflex 300/1200 Baud, IBM compatible, autodial, autoanswer, intelligent modem. For details see page 12 . . . . . **$399.00**

Apple Accessories

P-Kaso Universal Card **$225.00**

Saturn System Memory Cards
32K . . . . . **$CALL**
64K . . . . . **$CALL**
128K . . . . . **$CALL**

Neptune
80 column for Apple //e . . . . . **$CALL**
available with 64K, 128K, 192K

Titan
"Accelerator" for Apple . . . . . **$CALL**
6502, makes your Apple run 3½ times faster. 64K

Princeton
RGB-80 for //e **$265.00**
Scan Doubler **$369.00**

Amdek
DVM80E RGB int. for //e **$99.00**

Dymarc
Surge Suppressors:
DYMARC C-1200 120V single phase (15 amp)/ 3 outlet **$109.00**
DYMARC DP1102 (200VA) 1.8A load regulator/conditioner. **$469.99**

Spectronics
EPROM erasers avail. from **$129.00**

Cables
Parallel cable **$55.00**
RS232 cable **$55.00**
RS232 switch box, ABC **$140.00**
Centronics parallel ABC **$190.00**
Coaxial switch box ABC **$63.00**
Adapter male to male **$27.00**
Adaptor female to female **$29.00**
Connector RS232 male **$11.00**
Connector RS232 female **$12.00**
Connector RS232 male metal **$13.00**
Connector RS232 female metal **$14.00**

Printer Interfaces for Apple, Commodore, TRS-80 and Atari Star Micronics

INTERFACE	APPLICATION	APPLICABLE PRINTERS	PRICE
Grafstar II	Apple II, II + IIe and Apple compatible computers	Star Standard Printers*	$126.00
IEEE488X	Commodore CBM computers, Hewlett Packard	Gemini-10X/15X	$130.00
Gemini-10X/15X Serial	Serial Output Device	Gemini-10X/15X	$ 90.00
4010X 4K Serial	Serial Output Device (Usable with Modem)	Gemini-10X/15X	$190.00
Universal/Atari Parallel	Atari 400, 800 and XL Series	All Star Printers	$135.00
Universal/Commodore Parallel	Commodore 64 Series and VIC-20	All Star Printers	$ 99.00
STX-80/ Commodore Soft Cable	Commodore 64 Series	STX-80	$ 97.00
STX-80/Commodore Parallel	Commodore 64 Series and VIC-20	STX-80	$ 71.00
STX-80/Serial to Parallel	Serial Output Device	STX-80	$139.00
BUFFERS			
Gemini-10X/15X 4K Buffer	Increases internal buffer to 4K	Gemini-10X/15X	$167.00
Gemini-10X/15X 4K Buffer Upgrade	Increases 4K buffer	Gemini-10X/15X	$Call

Wizard
Intelligent printer int; optional buffer.
IPI **$89.00**
BP016K **$229.00**
BP032K **$279.00**

Microtek
Apple Dumpling **$119.00**
Commodore **$119.00**

Oranage Micro Printer Cards:
Buffered grappler **$307.00**
Grappler + printer interface **$160.00**
Parallel interface **$85.00**
Bufferboard/Apple **$199.00**
Bufferboard/Epson **$199.00**
Graphic parallel interface
Commodore **$187.00**
Bufferboard grappler **$160.00**
Mr CHIPS multifunction card **$567.00**
CHIPMUNK parallel interface **$171.00**
Grappler for IDS **$160.00**

Cardco for Commodore
Cardco (text only) **$65.00**
Cardco + G (graphics) **$120.00**

Botek
for TRS-80 . . . . . **$85.00**

Granny Smith
Parallel int. to //c **$180.00**

No-Name
32K buffer parallel int. & cable **$164.95**

Excelitronix

Multiflex Z80A "System"

Do you need a good, fast and reliable S-100 Z80A CP/M system?
One you can afford?. . Here it is. . $1,499.00,

TOP VALUE

The Loaded "SMART" Package

$1,499

Features:

- Z80A CPU with 64K Memory
- one RS-232 Serial Port (second RS-232 port optional)
- parallel printer port
- 6 slot S-100 Back Plane
- Floppy controller board capable of handling up to four DS DD, 5¼" or four 8" disk drives.
- video board 80 x 24 with buffer memory and keyboard interface
- IBM compatible professional (serial output) keyboard
- two SA 455 disk drives
- powerful power supply, with silent fan and power to spare for more 5¼" drives, if needed.
- CP/M software package optional

Optional:
256K memory board. See page 24 for description and price.

- CP/M 2.2. . . . . $159.00
- 12" Green or Amber Monitor. . . . . $139.00 (with cable, ready to plug into our video board)

MULTIFLEX RAM Disk Software

This software package implements a virtual disk drive on a RAM Board such as the MULTIFLEX S100 256K RAM Board. It will greatly improve the speed of all programs which are limited by disk access time. This package includes a thorough memory test routine to ensure reliable operation of your system as well as the new (G) version of the MULTIFLEX. This Package is included free with a purchase of our 256K populated board. (See page 24)

MULTIFLEX CPM BIOS (G) Version

This new version of the Bios improve the performance of all our Z80 based CP/M systems, in addition it fully supports the MULTIFLEX RAM Disk Software mentioned above permitting the user up to four (DS/DD) disk drives in his system one of which may be a RAM Disk.

Note: This package is included with all new orders of Smart Systems.

(CP/M 2.2 software is optional extra)

Multiflex Low-Cost Logic State Analyzer

You've just completed a microprocessor system, and it doesn't work. What next? You can use an oscilloscope to check for clock signals and the like, but if everything appears to be in order you can't go much further without sophisticated equipment. In these situations, professionals turn to their logic state analyzers, each of which cost thousands of dollars. MULTIFLEX has the answer for all those people who don't want to take a mortgage on their house just to get a computer working. The MULTIFLEX Logic State Analyzer has all the essential features of those more expensive units at a fraction of the cost. This is a high-quality piece of test equipment, suitable for industrial or scientific use, but its price is well within the price range of a hobbyist.

Easy to understand and operate, the Logic State Analyzer allows you to monitor 16 points in a digital system (ie. data and/or address bus, or control lines) which carry continually changing signals. You can select a bit pattern you expect will appear at these points. Once the pattern appears the Analyzer will trigger and record ("freeze") the next 1023 bit patterns so that they can be examined step by step even though data is no longer available in the unit being examined. For software development the Analyzer is invaluable, especially in dedicated systems. If you design a microprocessor system for a specific function, and you have no monitor, assembler or other such software, the best and often only way to debug the system is to use a logic analyzer. It will let you look closely at the data flow as a program is executing, or monitor the address lines to make sure that the instructions are being executed in the proper sequence. The various control lines such as memory read and write, DMA, interrupts, or enable and disable signals can also be examined. You can, of course, monitor any combination of these signals, such as the data bus and half of the address bus, or half of each plus 4 control lines. The combinations are endless.

A special feature of the MULTIFLEX Logic State Analyzer is that any number of units can be interconnected for dealing with larger input words. With two Analyzers, you can monitor the address and data bus of an 8-bit processor at the same time and have 8 spare signals to monitor the control lines, I/O signals or signals from external devices. Anyone who will be doing any systems debugging should take a close look at this unit, since its features and low price tag make it an asset.

Ideal Educational Tool and a MUST for the Hobbyist.

A&T $295

MULTIFLEX STANDALONE EPROM PROGRAMMER/ EMULATOR

This unit comes in two versions: a basic unit capable of programming a single EPROM, and a production unit which can program 8 EPROMS simultaneously. Both are capable of the EPROM emulator function, which allows in-circuit testing of code before it is used to program an EPROM. Code to be programmed into a device may be downloaded via RS232, or read from a previously programmed device. A small keyboard is used to enter, inspect, or modify data. Each EPROM to be programmed is individually buffered to prevent a defective device from affecting the programming of good devices, or damaging them or the programmer itself.

The unit contains a standard 16Kx8 of RAM, which may be upgraded to 64Kx8. Its serial interface is also capable of programming the interwoven data of 16 bit formats into their respective EPROMs. The programmer is capable of reading, emulating, and programming the 2716, 2732, 2732A, P2732A, 2764, 27128, 27128A, 27256, 27512, 2532, 2564, 2758, 2724 and 68764 devices. It also supports the fast programming mode and identifier for the larger devices. There are no personality modules as all connections are software switched.

From $399.00

Microprocessor Chips

6500 Series

6502	8-bit CPU (1 MHz)	6.69
6502A	8-bit CPU (2 MHz)	8.50
6522	VIA Versatile Interface Adaptor	8.99
6532	RIOT (128x8 RAM, I/O, Timer)	9.75
6545	CRT Controller	16.50
6511	ACIA Async. Comm. Interface Adaptor	18.00

6800 Series

6800	8-bit CPU (1 MHz)	6.50
6802	On Chip 128 x8 1MHz CPU	7.60
68B00	8-bit CPU (2 MHz)	7.39
6809	8/16-bit CPU (1 MHz)	16.50
68B09	8/16-bit CPU (2 MHz)	26.75
6810	128x8 static RAM	3.70
6821	PIA Periphrial Interface Adaptor	3.59
6840	Programable Timer	8.10
6844	DMA Controller	14.00
6845	CRT controller	10.95
68A45	CRT controller	14.95
6847	Video Display Generator	16.00
6850	ACIA	3.95
6852	Syncronous Serial Data Adapter	5.80
6860	0-600 Baud Modem	15.90

68000 Series

68000L8	16-bit CPU (8 MHz)	69.00
68000L10	16-bit CPU (10 MHz)	79.00
68008	16-bit CPU (8 bit data path)	52.00
68230	Parallel Interface Adapter	21.95
68450	6MHz 16-bit DMA Controller	250.00
68451	Memory Management Controller	189.00
68561	MPCC (68000 Compatible)	96.00

8080 Series

8080	8-bit CPU	9.80
8085	8-bit CPU	13.50
8212	8-bit I/O Port	3.50
8214	Priority Interrupt Controller	4.99
8216	4-bit Bidirectional Bus Driver	2.99
8224	Clock generator for 8080/8085	9.50
8226	Inverting Bus Driver	9.80
8228	System controller for 8080/8085	9.95
8251A	Programmable Communications Interface	10.50
8253A-5	Programmable Internal Timer	18.00
8253	Programmable Interval Timer	8.90
8255	Programmable Interface Adapter	8.25
8255A-5	Programmable Interface Adaptor	17.85
8257-5	Programmable DMA Controller	9.95
8259	Programmable Interrupt Controller	11.95
8272	Programmable Floppy Disk Controller	45.75
8275	Programmable CRT Controller	40.00
8279-5PC	Programmable Keyboard Display Interfac	9.90
8282PC	Octal latch, non inverting	15.95
8283PC	Octal latch, inverting	6.59
8284	Clock gen and driver	12.95
8286	8-Bit Bus trans. Non-Inverting	8.75
8287PC	8-Bit Bus trans. Inverting	8.69
8741ADC	Univ. Programmable Interface	34.95
8748DC	CPU, 4K EPROM, I/O	35.95
8749DC	CPU, EPROM, RAM, I/O	39.95
8755ADC	2048 x 8 EPROM, I/O	37.95

8086 Series

8086	16-bit CPU	25.00
8088	16-bit CPU c/w 8-bit data bus	29.00
8087	Math Processor	289.00
8089	I/O Processor	
8282	Octal Latch	14.00
8283	Inverting Octal Latch	6.69
8284	Clock Generator for 8086/8088	12.00
8288	Bus Controller	18.95
8289	Bus Arbiter	46.95
8237A5		28.95
8272		25.40

Z80 Series

Z80A-CPU	8-bit CPU (4 MHz)	5.50
Z80B-CPU	8-bit CPU (6 MHz)	14.85
Z80A-PIO	Parallel I/O	5.95
Z80A-CTC	Counter Timer	5.95
Z80A-DART	Dual Asyncronous Receiver Transmitter	12.95
Z80A-DMA	Direct Memory Access	18.95
Z80A-SIO-0	Serial I/O ver. 0	18.95

Misc. Microprocessors and Periphrial Chips

AY3-1015	UART (Single 5V Supply)	8.25
AY5-1013	UART	6.89
S1602	UART	4.75
TMS9918	Sprite Graphics Generator	46.45
TMS99532	FSK Modem	47.99
COM5016	Dual Baud Rate Generator	18.10
COM8116	Dual Baud Rate Generator (5V supply only)	16.75
KR3600	Keyboard Encoder	16.50
MSM5832	Real-time Clock	18.10
MSM58321	Real-time Clock	
SND5037	CRT Video Timer Controller	32.25
WD2143	4-phase Clock Generator for Floppy Disks	
FDC1771	Single Density Disk Controller	19.00
FDC1793	Double Density Disk Controller	47.00
FDC1795	Double Density/Sided Disk Controller	84.75
FDC2793	Dbl. Density Disk Controller c/w precomp.	55.00
FDC2795	DDDS Disk Controller c/w precomp.	59.95
FDC9216	Floppy Disk Data Separator	18.65

CMOS

4000	Dual 3 input NOR gate	.49
4001	Quad 2 input NOR gate	.49
4002	Dual 4 input NOR gate	.49
4006	18 static shift register	1.24
4007	Dual complementary pairs/inverters	.51
4008	4 bit full adders	1.25
4009	Hex buffer/converter (inverting)	1.20
4010	Hex buffer/converter	1.05
4011	Quad 2 input NAND gate	.49
4012	Dual 4 input NAND gate	.49
4013	Dual D Edge triggered flip flop	.79
4014	8 bit static shift register	1.25
4015	Dual 4 bit static shift register	1.25
4016	Quad bilateral switch	.82
4017	Decade counter/divider	1.29
4018	Presettable divide by N counter	1.25
4019	Quad and/or select gate	.75
4020	14 stage binary/ripple counter	1.29
4021	8 bit static shift register	1.29
4022	Divide by 8 counter/divider	1.27
4023	Triple 3 input NAND gate	.49
4024	7 stage binary counter	1.20
4025	Triple 3 input NOR gate	.49
4026	Decade counter/divider	1.99
4027	Dual JK flip flop	.78
4028	BCD to decimal decoder	1.19
4029	Presettable up/down binary/decade counter	1.29
4030	Quad XOR gate	.50
4033	7 segment decaded counter	1.76
4034	8 stage universal bus register	2.57
4035	4 stage PISO shift register	1.15
4038	Triple serial register	2.25
4040	12 stage binary/ripple counter	1.25
4041	Quad true complement buffer	1.17
4042	Quad clock D latch	1.12
4043	Quad tri state NOR R/S latch	1.15
4044	Quad tri state NAND R/A latch	1.15
4046	Micropower phase locked loop	1.24
4047	Low power monostable/astable multivibrator	1.19
4049	Inverting hex buffer	.79
4050	Hex buffer	.79
4051	Single 8 channel multiplexer/demultiplexer	1.27
4052	Dual 4 channel multiplexer	1.27
4053	Triple 2 channel multiplexer/demultiplexer	1.27
4054	4 segment display driver	1.75
4055	BCD to 7 segment recorder/LCD driver	1.75
4056	BCD to 7 segment recorder/LCD driver	1.75
4060	14 stage binary counter/oscillator	1.29
4066	Quad bilateral switch	.79
4068	8 input NAND gate	.47
4069	Hex inverter	.47
4070	Quad 2 input XOR gate	.47
4071	Quad 2 input OR gate	.47
4072	Dual 4 input OR gate	.47
4073	Triple 3 input gate	.47
4075	Triple 3 input OR gate	.47
4076	4 bit D register	1.17
4078	8 input NOR gate	.47
4081	Quad 2 input AND gate	.47
4082	Dual 4 input AND gate	.58
4086	Expandable 4 by 2 AND/OR invert gate	.67
4093	Quad 2 input NAND Schmitt trigger	.75
4094	8 stage shift/store register	2.50
4097	Diff 8 channel analog mux/demux	2.30
4099	8 bit addressable latch	1.65
4501	Industrial control unit	4.80
4502	Strobex Hex inverter/buffer	1.25
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4506	Dual Expandable AOI gate	2.50
4508	Dual 4 bit latch tri-state	2.85
4510	BCD up/down counter	1.19
4511	BCD to 7 segment latch/decoder/driver	1.50
4512	8 channel data separator	1.10
4514	1 of 16 decoder/demultiplexer	2.85
4515	1 of 16 decoder/demultiplexer	2.85
4516	Binary up/down counter	1.10
4518	Dual BCD up counter	1.19
4519	4 bit AND/OR select gate	1.45
4520	Dual binary up counter	1.15
4521	24 state frequency divider	3.99
4522	BCD divide by N counter	1.85
4526	4 bit binary divide by N counter	1.60
4527	BCD rate multiplier	1.25
4528	Dual retriggerable/resettable monostable	1.10
4529	Dual 4 channel mux	2.30
4530	Dual 5 input majority logic gate	1.65
4531	12 bit parity generator/checker	1.50
4532	8 bit priority encoder	1.10
4534	Real time 5 decade counter	7.99
4536	Programmable timer	5.55
4538	Dual precision monostable multivibrator	2.87
4539	Dual 4 channel digital multiplexer	1.75
4541	Quad 2 input analog mux	2.10
4543	BCD to 7 segment latch/decoder/driver	1.69
4553	3 digit BCD counter	5.05
4555	Dual binary 1 of 4 decoder	1.49
4556	Dual binary 1 of 4 decoder	1.49
4557	1-6 bit shift register	5.87
4558	BCD to 7 segment decoder	3.55
4560	NBCD adder	5.69
4561	9's complimenter	2.69
4562	128 bit static shift register	8.99
4556	Industrial time base generator	3.15
4568	Phase comparator/programmable counter	6.45
4572	Hex gate	1.25
4573	Quad programmable op amp	3.43
4575	Quad programmable comparator	4.25
4580	4 x 4 multiport register	6.49
4581	4 bit A/U	3.99
4582	Carry look ahead generator	1.75
4583	Dual Schmitt trigger	2.18
4584	Hex Schmitt trigger	1.29
4585	4 bit magnitude comparator	1.25
4702	Programmable bit rate generator	11.99

Linear

109	1A + 5V regulator	8.38
124	Quad op amp	3.95
139	Quad comparator	3.95
148	Quad op amp	5.50
300	General purpose op amp	4.10
301	General purpose op amp	.75
305	Voltage regulator	1.15
306	Improved voltage comparator	2.05
307	Op amp	1.25
308	Super beta op amp	2.50
309	+5V regulator	2.27
310	Voltage follower	3.38
311	Voltage compatator	1.50
317	3 terminal adjustable regulator	3.71
318	Precision high speed op amp	1.89
319	High speed dual comparator	2.55
323	3A + 5V regulator	7.95
324	Quad op amp	1.33
337	3 terminal negative regulator	2.23
339	Quad comparator	1.25
348	Quad low-power 741	.99
350	3A 3 term. positive adjust. regulator	7.25
355	FET input op amp	1.61
356	Monolithic J-FET input op amp	2.44
357	Monolithic J-FET input op amp (uncompensated)	3.12
358	Dual version of 324	1.69
380	2W audio amp	1.20
393	Dual version of 339	.91
398	Sample and hold amplifier	5.94
555	Timer	.58
556	Dual timer	1.02
558	Quad timer	2.95
567	Tone decoder	1.69
709	Op amp	1.39
710	Differential comparator	1.32
711	Dual channel differential comparator	1.30
714	Precision op amp	5.16
715	High speed op amp	5.25
723	Voltage regulator	1.39
725	Instrumentation op amp	3.69
726	Temperature controlled differential pair	65.25
727	Temp. controlled differential preamplifier	72.95
733	Differential video amp	1.95
739	Dual high performance op amp	2.25
741	Operational amplifier	1.25
747	Dual op amp	1.02
748	Op amp	1.14
749	Dual audio preamplifier	3.38
759	Power op amp	3.99
760	High speed differential comparator	11.95
776	Multi-purpose programmable op amp	1.95
796	Modulator/demodulator	3.25
1372	RF modulator	4.30
1436	High voltage op amp	4.49
1458	Dual op amp	1.70
1489	Quad RS232 line receiver	1.09
1495	Multiplier	5.25
1496	Modulator/demodulator	3.10
1524	Pulse width mod. reg.	15.35

Please Note: At the time of going to press, prices are fluctuating in both direcitons wildly. Prices here subject to change without notice. Whatever the prices are, ours should be the best. Check with use for quantity pricing, or group pricing.

Exceltronix

Linear

1558	Dual op amp	2.99
1595	Four quad multiplier	7.78
1596	Modulator/demodulator	5.49
1800	Demodulator	6.25
1889	Video modulator	6.25
3900	Quad op amp	0.95
26LS29	Quad RS423 line driver	5.49
26LS30	Quad RS422/432 line driver	3.95
26LS31	Quad differential line driver RS422	2.70
26LS32	Quad differential line driver RS422	2.70
26LS33	Quad differential line driver RS422	3.95
3470	Floppy disk read amplifier	5.99
3486	Quad RS422/423 line receiver	3.35
3487	Quad line driver RS422	3.35
76477	Analog complex sound generator	5.00
76478	Analog complex sound generator c/w amp	6.90
76489	Microprocessor cont. complex sound generator	8.30
8T26	Quad tri-state bus transceiver	1.70
8T28	Quad tri-state bus transceiver	2.59
TL070	Low noise bifet op amp	.79
TL071	Low noise bifet op amp	.69
TL072	Low noise bifet op amp	1.09
TL074	Low noise bifet op amp	2.10
TL075	Low noise bifet op amp	3.10
TL080	General purpose bifet op amp	.60
TL081	General purpose bifet op amp	.53
TL082	General purpose bifet op amp	.99
TL083	General purpose bifet op amp	1.66
TL084	General purpose bifet op amp	4.00
TL497	Switching voltage regulator	2.75
ULN2002	7 segment transistor array	1.35
ULN2003	7 segment transistor array	1.35
ULN2004	7 segment transistor array	1.75
XR200	Multifunction I.C.	67.75
XR205	Monolithic waveform generator	8.10
XR210	FSK modulator/demodulator	5.95
XR215	Phase lock loop	5.95
XR240	PCM repeater	11.95
XR320	Monolithic timing circuit	1.64
XR1310	Stereo demodulator	1.25
XR2206	Monolithic function generator	4.95
XR2207	Voltage controlled oxcillator	3.45
XR2208	Operation multiplier	3.45
XR2209	Precision oscillator	3.45
XR2211	FSK demodulator/tone decoder	3.90
XR2212	Precision phase locked loop	5.45
XR2213	PLL/tone decoder	5.45
XR2240	Programmable timer counter	1.99
XR2242	Long range timer	2.25
XR2567	Dual monolithic tone decoder	2.40
XR4739	Dual low noise op amp	1.55
XR14412	FSK modem system	9.39

Memories

TOP VALUE

Untouchable Prices!

Guaranteed Prime Stock

Dynamic RAMs

4116	1x16k 150ns	$ 1.85
4116	1x16k 200ns	$ 1.65
2118	1x16k 200ns	$ 3.95
(single +5V supply)		
4164	1x64k 150ns	$ 7.89
4164	1x64k 200ns	$ 7.19
41256	1x256k 150ns	$CALL

Static RAM

2114L	4x1k 200ns	$2.25
6514	4x1k CMOS 450ns	$4.99
6116	8x2k 150ns	$8.99
(CMOS low power consumption)		
2016	8x2k 150ns	$8.25
6164	8x8k 150ns	$CALL

EPROMS

2716	450ns 8x2k	$ 6.19
2716	300ns 8x2k	$ 7.45
2732	450ns 8x4k	$ 6.99
2732	300ns 8x4k	$ 7.99
2764	300ns 8x8k	$11.85
27128	350ns 8x16k	$CALL

74LS00 Series TTL

74LS00	Quad 2 input NAND gate	.59
74LS01	Quad 2 input NAND gate O/C	.59
74LS02	Quad 2 input NOR gate	.59
74LS03	Quad 2 input NOR gate O/C	.59
74LS04	Hex inverter	.69
74LS05	Hex inverter O/C	.59
74LS08	Quad 2 input AND gate	.59
74LS09	Quad 2 input AND gate O/C	.59
74LS10	Triple 3 input NAND gate	.59
74LS11	Triple 3 input NAND gate O/C	.59
74LS12	NAND gate inverter	.59
74LS13	Dual Schmidt trigger	.89
74LS14	Hex Schmidt trigger inverter	.89
74LS15	Triple 3 input NAND gate	.99
74LS20	Dual 4 input NAND gate	.69
74LS21	Dual 4 input NAND gate	.67
74LS22	Dual 4 input NAND gate	.99
74LS24	Quad 2 input NAND Schmidt trigger	1.39
74LS26	Quad 2 input positive NAND gate	.82
74LS27	Triple 3 input NOR gate	.79
74LS28	Quad 2 input NOR buffer	.85
74LS30	8 input NAND gate	.89
74LS32	Quad 2 input NOR gate	.79
74LS33	Quad 2 input NOR gate O/C	.65
74LS37	Quad 2 input NAND gate	.75
74LS38	Quad 2 input NAND gate O/C	.79
74LS42	BCD to decimal decoder	.95
74LS47	BCD to 7 segment decoder/ driver	1.49
74LS48	BCD to 7 segment decoder/ driver	1.89
74LS49	BCD to 7 segment decoder/ driver	1.60
74LS51	And/or invert gate	.75
74LS54	4 wide and/or invert gate	.79
74LS55	2 wide 4 input and/or invert gate	.75
74LS63	Hex current sensing switch	1.95
74LS73	Dual JK flip flop with clear	.89
74LS74	Dual D flip flop	.79
74LS75	4 bit bistable latch	.79
74LS76	Dual JK master/slave flip flop	.99
74LS77	4 but bistable latch	1.45
74LS78	Dual JK flip flop preset, common clear	.99
74LS83	4 bit binary full adder	1.32
74LS85	4 bit magnitude comparator	1.65
74LS86	Quad input XOR gate	.95
74LS90	Decade counter	1.20
74LS91	8 bit shift register	1.20
74LS92	Divide by 12 counter	1.20
74LS93	4 bit binary counter	1.20
74LS95	4 bit right/left shift register	1.69
74LS96	5 bit shift register async. preset	1.70
74LS107	Dual JK flip flop with clear	.95
74LS109	Dual JK pos. edge triggered flip flop	.99
74LS112	Dual JK edge triggered flip flop	.99
74LS113	Dual JK edge triggered flip flop	.99
74LS114	Dual JK edge triggered flip flop	.99
74LS122	Retriggerable monostable multivibrator	1.19
74LS123	Dual retriggerable monostable multivibrator	1.55
74LS125	Tri state quad bus buffer	1.20
74LS126	Quad 3 state buffer	.99
74LS132	Quadruple 2 input NAND Gate	1.28
74LS133	13 input NAND gate	.99
74LS136	Quad XOR gate	.95
74LS137	3 of 8 decoder/demultiplexer	.99
74LS138	3 to 8 decoder/multiplexer	.99
74LS139	Dual 1 of 4 decoder/demultiplexer	.99
74LS145	BCD to decimal decoder/driver	1.65
74LS147	10/4 priority encoder	2.99
74LS148	8 to 3 line priority encoder	2.99
74LS151	8 channel digital multiplexer	.99
74LS153	Dual 4/1 multiplexer	.99
74LS154	4 to 16 decoder multiplexer	2.99
74LS155	Decoder/demultiplexer	1.69
74LS156	Decoder/demultiplexer	1.69
74LS157	Quad selector/multiplexer	1.19
74LS158	Quad 2 input multiplexer (inverting)	1.90
74LS160	Decade counter with async. clear	1.50
74LS161	Sync. 4 bit counter	1.60
74LS162	Sync. 4 bit counter	1.69
74LS163	Sync. 4 bit counter	1.60
74LS164	8 bit serail shift register	1.60
74LS165	Parallel load 8 bit shift register	1.89
84LS166	8 bit PISO shift register	2.75
74LS168	Up/down decade counter	2.69
74LS169	4 bit sync. binary counter	2.59
74LS170	4 x 4 register file	2.70
74LS173	4 bit tri state register	1.38
74LS174	Hex D flip flop with clear	1.29
74LS175	Quad D flip flop with clear	1.29
74LS181	4 bit ALU	3.50
74LS182	Look ahead carry	2.75
74LS183	Dual carry/save full adder	6.00
74LS189	64 bit RAM	6.00
74LS190	Sync. up/down counter BCD	1.69
74LS191	Sync. up/down counter binary	1.65
74LS192	Binary up/down counter	1.65
74LS193	Binary up/down counter	1.65
74LS194	4 bit bi-directional shift register	1.19
74LS195	4 bit shift register	1.39
74LS196	Decade counter	1.99
74LS197	Presettable binary counter	1.99
74LS219	64 bit RAM	5.99
74LS221	Dual monostable multivibrator	1.89
74LS240	Octal inverting bus driver	1.69
74LS241	Octal bus driver	1.99
74LS242	Quad inverting transceiver	1.99
74LS243	Quad transceiver	1.99
74LS244	Tri state octal driver	1.89
74LS245	Octal bus transciever	2.60
74LS227	BCD to 7 segment decoder driver	2.53
74LS248	BCD to 7 segment decoder driver	2.53
74LS249	BCD to 7 segment decoder driver	2.53
74LS251	Tristate data selector multiplexer	.99
74LS253	Dual 4 bit multiplexer	1.20
74LS257	Quad 2 input multiplexer	.99
74LS258	Quad 2-1 multiplexer	.99
74LS259	8 bit addressabe latch	1.89
74LS260	Dual 5 input NOR gate	1.19
74LS266	Quad 2 input XNOR O/C	1.05
74LS273	Octal D flip flop	1.99
74LS275	7 bit slice Wallace tree	5.55
74LS279	Quad S-R latches	1.10
74LS280	9 bit odd/even parity checker/ generator	3.65
74LS283	4 bit binary full adder	1.29
74LS289	64 bit RAM	6.25
74LS290	Decade counter	1.69
74LS293	4 bit binary counter	1.89
74LS295	4 bit shift register	1.99
74LS298	Quad 2 input multiplexer	1.89
74LS299	8 bit storage register	3.65
74LS320	Crystal oscillator	5.65
74LS321	Crystal oscillator	5.65
74LS322	8 bit shift register	7.75
74LS323	8 bit bidirectional universal shift	7.65
74LS348	8 to 3 priority encoder	1.99
74LS352	Dual 4 bit multiplexer	3.25
74LS353	Dual 4 bit multiplexer	1.99
74LS354	Data selector multiplexer	1.99
74LS355	Data selector multiplexer	5.95
74LS356	Data selector multiplexer	5.95
74LS357	Data selector multiplexer	5.95
74LS365	Hex bus driver tri state	.99
74LS366	Hex bus driver (inverted output)	.99
74LS367	Hex bus driver	.99
74LS368	Hex bus driver (inverted output)	.99
74LS373	Octal transparent latch	2.19
74LS374	Octal dual flip flop	2.19
74LS375	4 bit bistable latch	1.15
74LS377	Octal D register	2.19
84LS378	Hex D register	2.19
74LS379	4 bit register	2.19
74LS380	Multi function octal generator	10.48
74LS381	4 bit ALU	5.43
74LS384	8 bit multiplier	9.88
74LS386	Quad 2 input XOR gate	.99
74LS390	Dual decade counter	1.25
74LS393	Dual 4 bit binary counter	1.99
74LS395	Tri state shift register	1.25
74LS396	Octal storage register	3.99
74LS398	Quad D flip flop	3.99
74LS399	Quad 2 input multiplexer with storage	2.95
74LS629	Voltage controlled oscillator	3.60
74LS670		1.49

74S00 Series TTL

74S00	Quad 2 input NAND gate	$ .79
74S02	Quad 2 input NOR gate	.79
74S03	Quad 2 input NOR gate O/C	.79
74S04	Hex inverter	.79
74S05	Hex inverter O/C	.79
74S08	Quad 2 input AND gate	.79
74S09	Quad 2 input AND gate O/C	.79
74S10	Triple 3 input NAND gate	.79
74S11	Triple 3 input NAND gate O/C	.79
74S15	Triple 3 input AND gate O/C	.79
74S20	Dual 4 input NAND gate	.79
74S22	Dual 4 input NAND gate O/C	.79
74S30	8 input NAND gate	.79
74S32	Quad 2 input NOR buffer	.85
74S37	Quad 2 input NAND buffer	2.49
74S38	Quad 2 input NAND buffer O/C	2.49
74S40	Dual 4 input NAND buffer	.99
74S74	Dual D flip flop	1.20
74S85	4 bit magnitude comparator	2.95
74S86	Quad 2 input XOR gate	1.65
74S109	Dual JK positive edge triggered flip flop	2.69
74S112	Dual JK flip flop	1.29
74S113	Dual JK negative edge triggered flip flop	1.45
74S114	Dual JK negative dge triggered flip flop	1.45
74S124	Dual VCO	4.50
74S132	Quad 2 input Scmitt trigger NAND	2.40
74S128	3-8 decoder/multiplexer	1.99
74S139	Dual 2-4 decoder/multiplexer	1.99
74S140	Quad line driver	1.60
74S151	8 channel digital multiplexer	1.99
74S153	Dual 4-1 multiplexer	1.99
74S157	Quad 2 input multiplexer	1.99
74S158	Quad 2 input multiplexer	1.99
74S160	Decade counter with async. clear	5.89
74S161	Sync. 4 bit counter	5.99
74S162	Sync. 4 bit counter	6.99
74S163	Sync. 4 bit counter	5.00
74S168	4 bit up/down sync. counter	7.44
74S169	4 bit sync. counter	7.59
74S174	Hex D flip flop with clear	2.50
74S175	Quad D flip flop with clear	2.50
74S181	ALU	5.99
74S182	Look ahead carry generator	3.75
74S189	16 x 4 RAM	5.50
74S195	4 bit parallel access shift register	2.99
74S196	Presettable decade counter	4.95
74S197	Presettable binary counter	4.95
74S201	256 bit RAM	8.95
74S240	Octal line driver	3.99
74S241	Octal line driver	3.99
74S244	Octal line driver	4.75
74S251	Tri-state data selector multiplexer	2.65
74S260	Dual 5 input NOR gate	1.75
74S283	4 bit binary full adder	4.99
74S289	16 x 4 RAM	5.20
74S299	8 bit universal shift storage register	9.99
74S373	Octal D latch	3.99
74S374	Octal D latch	3.99

We apologize for the high pricing. This is due to the severe parts shortages and our costs have in most cases doubled. Unfortunately this shortage is expected to last until 1985.

We do however have an enormous inventory of hundreds of thousands of parts and we can supply industry at bulk rate pricing.

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Trim Pots

P.C. MOUNT MULTITURN TRIMPOTS

RESISTANCE				
10	500	10K	200K	
20	1K	20K	500K	
50	2K	50K	1M	
100	5K	100K	2M	
200				

$1.65 ea.

TRIMPOTS

RESISTANCE				
100	1000	10K	100K	1M
250	2500	25K	250K	2.5M
500	5000	50K	500K	5M

OPEN CASE 35¢
ENCLOSED CASE 85¢

Tantalum Capacitors

DIPPED TANTALUM CAPACITORS

uF	WORKING VOLTAGE (V) 3	6.3	10	16	25	35
.1	—	—	—	—	—	.27
.15	—	—	—	—	—	.27
.22	—	—	—	—	—	.27
.33	—	—	—	—	—	.27
.47	—	—	—	—	—	.27
.68	—	—	—	—	—	.27
1.0	—	—	—	—	.27	.27
1.5	—	—	—	—	.27	.34
2.2	—	—	—	.27	.30	.37

uF	WORKING VOLTAGE (V) 3	6.3	10	16	25	35
3.3	—	—	.27	.30	.37	.41
4.7	—	.27	.30	.37	.41	.54
6.8	—	.30	.37	.40	.51	.60
10	.27	.34	.40	.51	.64	.78
15	.34	.40	.48	.52	1.10	1.73
22	.37	.48	.52	.71	1.50	2.17
33	.40	.53	.71	1.19	2.22	3.34
47	.48	.53	1.10	1.91	3.33	4.50
68	.58	.75	1.91	2.20	4.82	—

Connectors

PINS	SOLDER TAIL STRAIGHT	MALE RIGHT ANGLE	WIRE WRAP STRAIGHT	MALE RIGHT ANGLE	RIBBON CABLE FEMALE
20	2.09	2.09	2.97	2.97	2.70
26	2.69	2.69	3.65	3.65	3.42
34	3.50	3.50	4.29	4.29	4.44
40	3.97	3.97	4.83	4.83	5.22
50	4.76	4.76	5.63	5.63	6.50
60	5.75	5.75	6.78	6.78	8.16

Opto

TRANSISTOR OUTPUT	
MCT26	.96
4N28	.85
4N26	.85
MCT2	1.02
4N38	1.16
4N37	1.16
4N25	.85
4N27	.85
4N35	1.16
4N36	1.16
DARLINGTON OUTPUT	
4N31	1.16
4N29	1.13
4N30	1.13
4N32	1.16
4N33	1.16

TRIAC DRIVER OUTPUT	
MOC3011	1.81
MOC3020	1.37
MOC3030	2.04
MOC3031	2.68
SCR OUTPUT	
MOC3002	1.81
MOC3003	2.60
TIL4	
RECTANGULAR	.45
ROUNDED	
RECTANGULAR	.45

JUMBO LED	
RED	.25
GREEN	.30
YELLOW	.35
ORANGE	.35
7 SEGMENT DISPLAYS	
DL1416	347 1
FND500	2.04
FND507	2.04
FND501	2.04
FND508	2.04
TIL313	1.85

IC Sockets

	8	14	16	18	20	22	24	28	40
SOCKETS SOLDERTAIL	16¢	28¢	32¢	36¢	40¢	44¢	48¢	56¢	80¢
SOCKETS WIRE WRAP	65¢	89¢	1.11	1.17	1.49	1.69	1.75	1.89	1.98
LOW PROFILE MACHINE CONTACT	1.69	2.50	2.75	3.50	3.89	4.00	4.75	4.75	5.95
COMPONENTS PLATFORM	— —	1.99	2.50	— —	— —	— —	3.39	— —	5.85
DIP HEADER	— —	2.35	2.75	— —	— —	— —	3.50	— —	5.60

D-Shell Connectors

D—SHELL CONNECTORS

SUFFIX PINS	(XX-Z) PART#	RACK/PANEL CONNECTORS RP-P	RP-S	INSULATION DISPLACEMENT ID-P	ID-S	PRINTED CIRC. MOUNT PC-P	PC-S
9	DE-9-XX-Z	3.63	3.67	5.28	5.70	— —	— —
15	DE-15-XX-Z	4.95	4.95	7.12	7.68	— —	6.85
25	DE-25-XX-Z	6.50	6.50	9.50	9.50	10.50	8.50
37	DE-37-XX-Z	6.95	11.00	12.35	13.48	— —	— —
50	DE-50-XX-Z	9.00	14.95	— —	— —	— —	— —

SUFFIX NOTES:
RP = STANDARD SOLDERTAIL
ID = RIBBON CABLE
PC = PRINTED CIRCUIT MOUNT (RIGHT ANGLE)
P = PLUG
S = SOCKET

D—SHELLS

PART#	
SH-9-X	3.75
SH-15-X	2.05
SH-25-X	2.05

Bridge Rectifiers

OUTPUT CURRENT	1.0A	2.0A	3.0A	6.0A	10.0A	25.0A
CASE STYLE	D-43	D-44	D-45	D-46	D-34	D-34
VOLTAGE						
50	-----	2KBP005 $0.95	DBPC1005 $1.46	KBPC6005 $2.18	100JB05L $3.25	250JB06L $3.25
100	1DMB10 $0.60	-----	-----	-----	100JB1L $3.25	250JB1L $3.35
200	1DMB20 $0.65	2KBP02 $1.25	KBPC102 $1.55	KBPC602 $2.35	100JB2L $3.38	250JB2L $3.45
400	1DMB40 $0.69	2KBP04 $1.50	KBPC104 $1.70	KBPC604 $2.53	100JB4L $3.51	250JB4L $3.58
600	-----	2KBP06 $1.65	KBPC106 $1.87	KBPC606 $2.85	100JB6L $4.55	250JB6L $4.75

SCR's, DIAC's, & TRIAC's

SCR's				
2N5061	800mA	60	TO-92	.67
2N5062	800mA	100	TO-92	.75
2N5063	800mA	150	TO-92	.79
2N5064	800mA	200	TO-92	.85
2N6333	2A	50	TO-39	1.97
2N6334	2A	100	TO-39	2.05
2N6335	2A	200	TO-39	2.31
2N6336	2A	300	TO-39	2.51
2N6337	2A	400	TO-39	2.73
TIC106B	5A	200	TO-220	0.79
TIC106D	5A	400	TO-220	0.85
TIC116B	8A	200	TO-220	1.59
TIC116D	8A	400	TO-220	1.65
TIC116M	8A	800	TO-220	3.66
TIC126B	12A	200	TO-220	1.75
TIC126D	12A	400	TO-220	2.25
TIC126M	12A	600	TO-220	3.66

DIACS		
D3202Y	2A	
D3202U	2A	

TRIACS PART #	Im	PIV	CASE	
TIC206B	3A	200	TO-220	1.38
TIC206D	3A	400	TO-220	1.47
TIC216B	6A	200	TO-220	1.69
TIC216D	6A	400	TO-220	1.75
TIC226B	8A	200	TO-220	1.64
TIC226D	8A	400	TO-220	1.69
TIC236B	12A	200	TO-220	1.76
TIC236D	12A	400	TO-220	1.82
TIC263B	25A	200		3.04
TIC263D	25A	400		3.96

SIP (single in-line package)

PART #	PINS	COMMON PIN #	
6-1-XXX	6	1	0.79
8-1-XXX	8	1	0.90
10-1-XXX	10	1	0.95

XXX = Value

Send for our flyer on active and passive components.

Transistors

We have a large selection of small signal and JFET transistors in stock.

DEVICE	PRICE	POL.		BVceo	Icmax	ft or Pdiss	hfe	CASE
TIP47	.91	NPN	si	250V	1A	40W	25 min	TO-220
TIP48	.97	NPN	si	300V	1A	40W	25 min	TO-220
TIP49	1.02	NPN	si	350V	1A	40W	25 min	TO-220
TIP50	1.02	NPN	si	350V	1A	40W	25 min	TO-220
TIP110	.89	NPN	si	60V	2A	50W	500 min	TO-220
TIP111	.89	NPN	si	80V	2A	50W	500 min	TO-220
TIP115	.78	PNP	si	60V	2A	50W	500 min	TO-220
TIP120	.99	NPN	si	60V	5A	65W	1000 min	TO-220
TIP121	.99	NPN	si	80V	5A	65W	1000 min	TO-220
TIP122	1.01	NPN	si	100V	5A	65W	1000 min	TO-220
TIP125	.94	PNP	si	60V	5A	65W	1000 min	TO-220
TIP127	1.14	PNP	si	100V	5A	65W	1000 min	TO-220
TIP140	2.75	NPN	si	60V	10A	125W	500 min	CP-3
TIP141	2.99	NPN	si	80V	10A	125W	500 min	CP-3

DEVICE	PRICE	POL.		BVceo	Icmax	ft or Pdiss	hfe	CASE
TIP142	3.15	NPN	si	100V	10A	125W	500 min	CP-3
TIP146		PNP	si	80V	10A	125W	500 min	CP-3
TIP2955	1.26	PNP	si	60V	15A	90W	500 min	CP-3
TIP3055	1.15	NPN	si	60V	15A	90W	15 min	CP-3
TIS43		UJT	si	30V	50ma	— —	— —	TO-92
TIS58		N-JFET	si	25V	10ma	— —	— —	TO-92
TIS59		N-JFET	si	25V	10ma	— —	— —	TO-92
TIS62		NPN	si	12V	30ma	500 MHz	30 min	TO-92
TIS73		N-JFET	si	30V	50ma	— —	— —	TO-92
TIS74		N-JFET	si	30V	50ma	— —	— —	TO-92
TIS75		N-JFET	si	30V	50ma	— —	— —	TO-92
TIS84		NPN	si	30V	50ma	100 MHz	45 typ	TO-92
TIS86		NPN	si	30V	50ma	500 MHz	200 max	TO-92
TIS87		NPN	si	45V	50ma	500 MHz	150 max	TO-92

Voltage Regulators

POSITIVE	
7805 + 5V 1A	.99
78L05 + 5V .1A	.75
78H05 + 5V 5A	9.44
78P05 + 5V 10A	14.97
7806 + 6V 1A	.99
78L06 + 6V .1A	.75
7812 + 12V 1A	.99
78L12 + 12V .1A	.75
78H12 + 12V 5A	10.95
7815 + 15V 1A	.99
7824 + 24V 1A	.99
78GUIC Adjust. 1A	1.80
78HGASC Adjust 5A	11.47
78S40 Switching regulator	3.84

NEGATIVE:	
7905 .5V 1A	.99
79L05V. 1A	.75
7906 -6V 1A	.85
7912 -12V 1A	.85
79L 12-12V. 1A	99
7915-15V 1A	99
79GUIC Adjust. 1A	1.65
79HGASC Adjust 5A	17.99

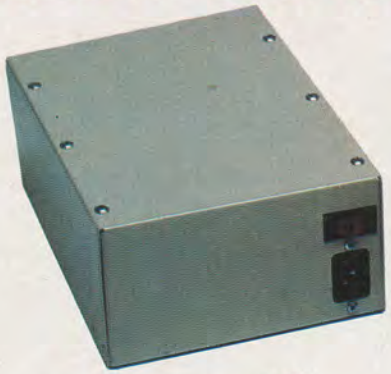
We carry a full selection of 0.25W resistors 3¢ each.

Large selection of capacitors of all types.

Excelitronix

POWER SUPPLIES and TEST GEAR

This is the deal of the Century



KEPCO POWER SUPPLIES
Rated at 90W Max.!
RFI filter and fuse on board, 115/230V

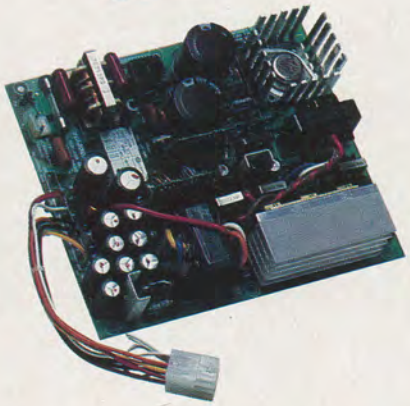
Open Fame $49.00
Cased with no fan . . . . . $ 99.00
Cased with powerful, 3" silent fan $109.00
Cased Dual Unit, 175W $149.00
Quantity discounts available. Dealer enquiries invited.

Hydro approved, Cased version is designed so that the fan draws the air from inside of the system, through the power supply box and out. Beautifully quiet, switching power supply.

After evaluating a dozen power supply manufacturers, we found a supply, which truly exceded our expectations. This KEPCO power supply is a high quality switching power supply, which meets industrial needs and will superceed hobbyists requirement. We highly recommend it. This supply is made in JAPAN, not TAIWAN. This power supply module would normally cost approximately $100.00 wholesale price, in thousand lots. Due to the fact that we purchased over 5 thousand of these units, which we also use in production, we would like to pass along the savings... Take advantage of this opportunity.

Ratings: Dual 12 Volts,
12 V at 2.8A 12 V at 2 A -12V at .5A
+ 5 V at 5.0A We tested the + 5V, it works beautifully beyond 6 A. We also tested these power supplies at much heavier loads and they worked perfectly. You can get considerably better performances from these supplies, when they are fan cooled. Documentation and schematics are provided with each KEPCO power supply.

Ideal for 8088 and other IBM compatible system. Will handle up to 4x5¼" disk drives with power to spare.



Boschert Power Supply $199.00

+5V @ 6A, +15V @ 3.7A, -15V @3.7A with power cord, RFI filter, cased, fuse and switch. +15V easily changed to +12V by adding 78H12 regulator.

3200-Digital Hi-Tester

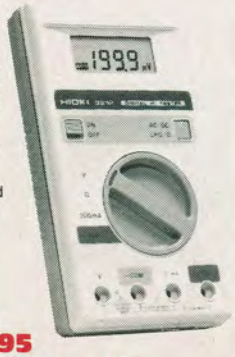
- Full Autorange Function (except current)
- LO Power OHMS permits In-Circuit measurements.
- Display Holder Feature
- Audible Continuity Test
- Lamp Reports overvoltage in OHMS and range
- Current measurement up to 10A is possible.

Price — $179.95
Accuracy ±0.5% to ±1.0%

3212 Digital Multimeter

is a "No Frills" DMM designed to give maximum performance at a price you can afford.

- Full Autoranging (except current)
- High current measurement capability
- LO OHMS for In-Circuit measurement
- Over voltage protection to AC 250V in both current (except 10A) and OHMS range.



Price — $104.95
Accuracy ±.7% to ±1.0%

3211 Pencil Hi-Tester

- Measures Volts, OHMS and is a audible continuity tester
- Display Hold Function handy for taking reading after tester has been taken out of a hard-to-reach location.
- Full Autoranging
- The "Touc-To-Circuit" concept makes the 3211 a valuable tool for use in troubleshooting and maintenance
- comes with CASE

Price — $94.95

Accuracy ±0.7% to ±1.0%

Logic probes from $29.95

Oscilloscopes
(call for quantity pricing)

Hameg Scopes
Two year warranty
(CSA approved)

HM103 — $550.00
10 MHz single trace, built-in components tester, internal graticule (6x7 cm) triggers up to 30 MHz.

HM203-4 — $835.00
BEST SELLER
20 MHz, dual trace, built-in component tester, internal graticule (8x10 cm), triggering — DC to 30 MHz.

HM204 — $1120.00
20 MHz, dual trace, built-in component tester, internal graticule (8x10 cm), triggering DC to 40 MHz, sweep delay function 100nS to 1 sec with variable fine control.

Hitachi Portable Osciloscopes
(call for quantity pricing)

V-353F — $CALL
35 MHz dual delayed sweep, 5.5 inch screen includes delaying feature.

V-203F — $CALL
20 MHz dual trace, delayed sweep, 5.5 inch square CRT.

We also carry Beckman Digital Multimeters at discount prices

Hobbyist Delights

Hard To Get Parts For Your 8088 Systems & IBM Compatible Peripherals

Please realise that out parts are prime quality, at lowest prices and we have excellent stock!

8088 CPU	$ 29.00
8087 mth. proc.	$289.00
8237A-5 prog. DMA cntrllr	$ 32.95
8237A-5 (NEC) prog DMA cntr	$ 28.95
8250 serial	$ 15.89
8253A-5 INTEL prog. intrvl. timer	$ 18.00
8253A-5 NEC prog. intrvl. timer	$ 10.95
8255A-5 INTEL P.I.A.	$ 17.95
8255A-5 (other brands)	$ 8.95
8259A INTEL prog. interrupt cntrl	$ 12.00
8259 NEC prog. interrupt cntrl	$ 9.80
8284 INTEL ADC clock gen & driver	$ 13.50
8284 SIEMENS ADC clock gen & driver	$ 8.80
8288 INTEL bus controller	$ 27.95
8288 (other) bus controller	$ 17.00
8086 CPU	$ 25.00
UPD 765 disk controller	$ 35.00
8272 INTEL equiv. to UPD 765 disk controller	$ 26.40

NOTE: For best results we recommend the use of INTEL components!!

Hard to get small parts

100ns delay line	$ 8.95
7ns delay line	$10.95
7ns delay line	$ 0.00
can be replaced by piece of wire in most cases	
62 pin edge con (high quality)	$ 2.65
5 pin DIN conn.	$ 1.79
Power conn	$ 1.50
Dip switch 8 pos	$ 2.49
4.7k x 6 sip	$ .69
4.7k x 8 pin sip	$ .69
8.2k or 10k 16 pin Resistor network	$ .99
330 ohm network	$ 1.10
Small speaker	$ 1.99
.1 uf 50V high quality bypass capacitors	$ .15
34 pin card edge con. for your floppy controller	$ 8.95
74LS322	$ 8.95
74LS629	$ 6.29
74LS670	$ 1.49
74LS280	$ 3.65
74LS125	$ 1.20
74S157	$ 1.99
74LS244	$ 1.89
74LS245	$ 2.60
74LS273	$ 1.99
74LS373	$ 2.19
75477	$ 2.09

KEYBOARDS FOR YOUR IBM COMPATIBLE

The following key boards are factory specked beyond 20 million operations (are your fingers?)

Maxi switch high quality	$157
Cherry high quality (Great feel)	$157
Keytronics	$CALL

BUY THE REAL THING

We have checked out many keyboard companies, and we have concluded that Maxi switch and Cherry keyboards are a super value for your money. We find them both equally good.

NOTE: We carry hugh inventory of the popular Maxi switch and Cherry keyboards, however, we stock only a few Keytronics keyboards.

Crystals great stock in all locations

1.000 MHz	$ 6.50
1.8432 MHz	$ 4.50
4.000 MHz	$ 3.95
3.579545	$ 2.95
4.032 MHz	$ 4.50
6.000 MHz	$ 3.95
8.000 MHz	$ 3.75
10.000 MHz	$ 3.65
14.318 MHz	$ 2.90
16.000 MHz	$ 3.95
17.430 MHz	$ 3.95
18.000 MHz	$ 4.50
18.432 MHz	$ 4.50

Hard to Get Parts For Your 6502 Systems and APPLE Compatible Peripherals

Remember — prime quality, ultra good prices and super good stock at all of our locations!

6502 CPU	$ 6.69
6845 CRT controller	$10.95
68A45 CRT controller	$14.95
Z80A CPU (4 MHz)	$ 5.50
MC3242	$13.95
74LS367	$ .99
74LS259	$ 1.89
74LS161	$ 1.60
74S74	$ 1.20
74S174	$ 2.50
74LS323	$ 6.50

Hard to get small parts

Card edge connector	$2.89
RCA jack PC mount	$ .69
6 pin power square connector	$ .99
Phono jack (small)	$ .99
MPSA13 trans	$ .55
2N3904 trans	$ .19
2N3906 trans	$ .27
MPSU51 trans	$ .79
2N4258 transistor or equiv	$ .69
1K SIP 10 pin	$ .69
1K SIP 8 pin	$ .69
10K SIP 10 pin	$ .75
4 pos dip sw	$ .95
20 pin female header for disk drive	$1.79
20 pin male	$1.69
50 pf trim cap	$ .89
220 ohm trimpot	$ .69
20 conductor ribbon cable	$ .89/ft.

CASES SUPER VALUE

This attractive case made out of metal and aluminum, with a superb paint job looks like the real thing. It is made so that 8088 peripheral boards can be mounted securely to the case, rather than hanging loose in the motherboard. This case is ideal for use with the 8088 board or 6502 boards. Customers have remarked that they have not seen any other case which looked as well designed as this one. We highly recommend it.

We can now offer you a choice of two types of high quality cases for your IBM compatible or 6502 boards! (as per picture)

Standard sliding top **$65.00**

With 90W Max power supply & fan **$169.00**

or our new super two point hinged top for fast & easy access **$74.95**

With 90W Max power supply & fan **$178.95**

SUPERB 6502 CASE and keyboard with numeric keypad and great power supply ..... $199.00 (Limited time only)

MEMORY Untouchable Prices!

Guaranteed Prime Stock

Dynamic RAMs

4116	1x16k 150ns	$ 1.85
4116	1x16k 200ns	$ 1.65
2118	1x16k 200ns (single +5V supply)	$ 3.95
4164	1x64k 150ns	$ 7.89
4164	1x64k 200ns	$ 7.19
41256	1x256k 150ns	$CALL

Static RAM

2114L	4x1k 200ns	$2.25
6514	4x1k CMOS 450ns	$4.99
6116	8x2k 150ns (CMOS low power consumption)	$8.99
2016	8x2k 150ns	$8.25
6164	8x8k 150ns	$CALL

EPROMS

2716	450ns 8x2k	$ 6.19
2716	300ns 8x2k	$ 7.45
2732	450ns 8x4k	$ 6.99
2732	300ns 8x4k	$ 7.99
2764	300ns 8x8k	$11.85
27128	350ns 8x16k	$CALL

DISK DRIVES

BEST SELLER

The real thing! SA455 Shugart 5 1/4" SLIMLINE DS,DD 40 tracks per side disk drive.
(Two drives fit into space of one full height drive)
265 DAY WARRANTY!

ONLY $239

SA390 Drive mechanism **$179**

Hard Disk

Seagate (industry favoured) 10 MEG. slimline **$989**

10 MEG Seagate, slimline drive and hard disk controller. This controller can handle up to two 10 MEG hard drives

LOWEST PRICE OF . . $1299

For details see p. 12

Instead of Struggling and building your own elusively cheaper peripherals, buy our high quality guaranteed fully tested and professionally built flow-soldered and ultrasonically cleaned products at unbelievable prices.

MULTIFLEX SERIAL KEYBOARD ENCODER

- changes the serial code into parallel ASCII output with programmable characters.
- Ideal for your Apple, or any 6502 system with ASCII input.

You will love it and to the best of our knowledge, only we carry such a deluxe feature board.

$69.00

CHECK THIS OUT!

Electrohome NEW 5" green screen monitors $59.00

- brand new open frame monitor, requires 12V power supply Sync separator board, (if needed)

(only 300 in stock. Hurry!) **$13.00**

Exceltronix

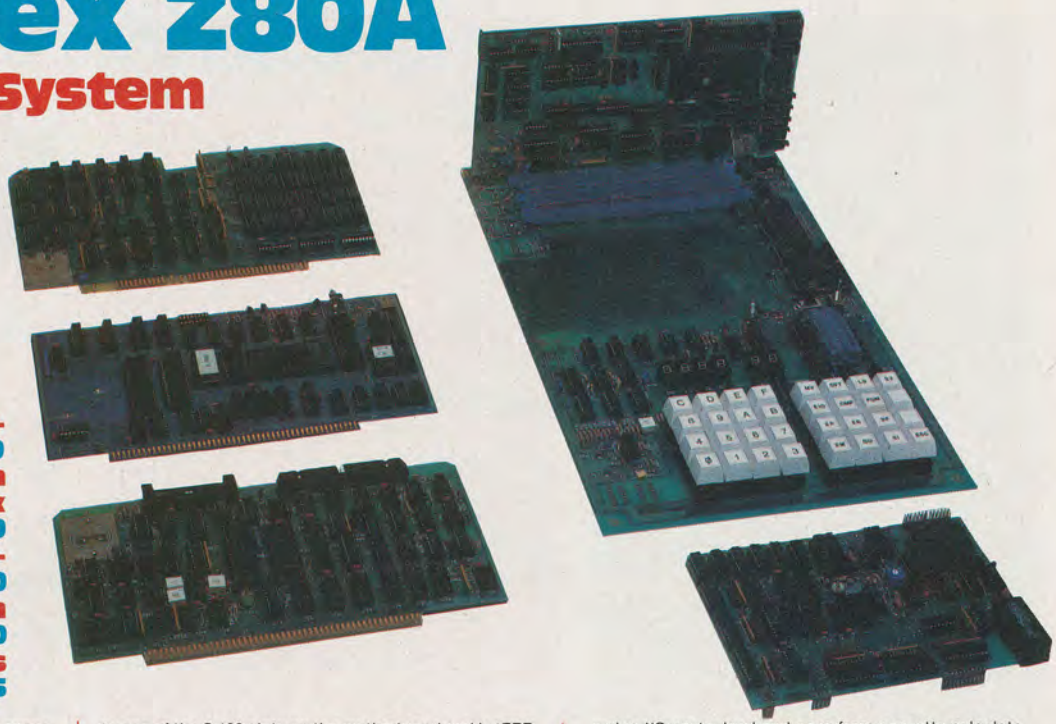
Multiflex Z80A

S100 Starter System

Complete, assembled and tested

TOP VALUE

$299



Options:

64K Dynamic RAM & Multiplexers $88.00
Big Piggyback Board with RS232 and Real Time Clock $179.00
RS232 Option for Motherboard $38.00
DC to DC Converter Option $29.00
Extra S-100 Connectors (each) $5.95

MULTIFLEX's Z80 computer is a versatile and expandable stand-alone computer system designed and built right here in Canada. It uses the newest technology to provide the user with the most capabilities for the smallest price-tag. Its adaptability to any situation and extremely low cost allow it to be used in many applications ranging from a trainer to a complete CP/M-based computer comparable to the best on the market, at a fraction of the price.

The actual layout of the system is a two board design. One board (the "motherboard") contains a 24-line parallel I/O chip for interfacing to the external world, an RS232C serial port with baud rates selectable from 110 to 9600 baud, a hex address and data display, a hex keypad, 14 monitor function keys, 2 user definable keys, a 40-chip wire wrap area with full access to all the bus signals, on-board provision for regulators so that the board can be supplied with standard S-100 voltages, an EPROM programmer which will handle 2708 (1Kx8), 2716 (2Kx8), 2732 (4Kx8) 2532 (4Kx8), 2764 (8Kx8) and the brand new 27128 (16Kx8) EPROMs, a DC-to-DC converter to supply the programming voltage to the EPROM programmer and four (4) slots for IEEE S-100 compatible boards for further expansion. This is an extremely useful and inportant feature as it allows expansion of the system with all boards using this industry-standard bus structure, which are available from MULTIFLEX, as well as from hundreds of manufacturers worldwide.

The other board is the CPU card. This card plugs into one of the S-100 slots on the motherboard and is IEEE 696/S-100 compatible with the full 24-bit address path to allow up to 16 megabytes of memory to be addressed. The processor used is the Z80 (running up to 6 MHz) and there is provision on-board for 64K of dynamic memory (using 4164 chips) which will operate without wait states. Provided for as well is a 2K to 32K (selectable in 2K blocks) common resident area in memory for use with multiple memory banks. There are also 4 sockets on board which will handle 2732 (4Kx8) or 2764 (8Kx8) EPROMs or the new 6116/2016 (2Kx8) static RAMs (all of which can be software deselected if desired) to allow the user complete versatility in setting up the board to meet his own specifications. Also on board is 1 parallel port with 24 lines of I/O and 3 16-bit counter/timers for applications which require the unit to keep track of real time. Another feature of the CPU board is that it was designed by our engineers to run the CP/M 2.2 disk operating system so that if a floppy disk controller board is added to the system a fully configured CP/M machine can be set up for a very low cost as described on page 13.

The monitor software that comes with the kit is a well-written extensive package which allows the user to have complete versatility in machine language programming and execution as well as control of all the features on the board. The monitor functions include: examine/modify memory locations, memory block moves, compare 2 blocks of memory, examine CPU register, examine I/O ports, load and save from cassette calculate relative branch offsets, set breakpoints single step programs, execute programs, and program EPROMs. Each of these process is invoked by a single keypress. Also available to the use are 2 spare keys definable for special functions a required by specific applications and applicator programs.

Available as an option, there is a piggyback board which attaches to the CPU board and give the user a real-time/time-of-day clock with battery back-up, memory management for up-to 16M of memory in 4K blocks, 2 RS232C ports which have independent software selectable baud rates, vectored interrupts for the onboard I/O and clock devices, and a general interrupt controller designed to handle multiple intterupts for up to 7 other boards.

All these features make this a very impressive stand-alone unit and, when combined with the S-100 boards either from the MULTIFLEX line r from most other manufactures, give the user the potential for a very powerful microcomputer system.

The standard kit includes the CPU board with a Z80A (4HMz) processor, 2K of RAM (a 6116), and 4K of EMPROM (a 2732) as well as the motherboard with all the features mentioned above except the RS232C port and the DC-toDC converter. Also supplied are sockets for all IC's and 1 S-100 connector.

Multiflex S-100 Video Board

This board is an intelligent, I/O mapped, 80 x 24 Video Display Board. Based on the 8275 programmable CRT controller, the 8257 programmable DMA controller, and a Z80 processor. Provided on board is 8K of static RAM which gives the user 3½ screens of text. With simple commands, the user can easily scroll around in this buffer, clear the present page and home, home on the present page and go to the beginning of the buffer. There are also 4 field attributes (blink, reverse video, underline, and highlight) which can be turned on and off by software. Other software commands include a carriage return, line feed, clear to end of line; transmit cursor location; transmit character at cursor location; position cursor; disable control functions; reset control register; as well as all the standard functions such as tab return, line feed, and backspace. Also included in the software is a debug/setup program which completely tests the board and allows the user to set up various parameters on it. The output from the board is in either composite video or a video signal with separate horizontal and vertical sync signals (either normal or inverted).

$269.00

Multiflex S-100 Floppy Disk Controller

The MULTIFLEX floppy disk controller is a state-of-the-art IEEE 696/S-100 compatible board. It allows the user to interface, simultaneously, up to four (4) 8 inch or 5¼ inch disk drives in any combination to his system with the flexibility of single/double sided and single/double density operation. If desired, all operations with the optional on-board controller or under processor control. Latest technology has been used in this design. The board is designed around the FD2793 controller chip for easy use under any operating system. However, this board is especially designed for easy use with the CP/M or MP/M operating system (available as an option) and the MULTIFLEX Z80 computer kit. With all these features and its reasonable cost, this board is one of the best buys in a floppy disk controller board on the market today.

$269.00

DMA Option $100.00

MULTIFLEX 256k RAM CARD

• Provides user with upto 256k of Dynamic RAM. • Uses 4164 150ns. • Refresh of RAM can be handled externally (if Z80 processor is available or internally if no refresh signal is available. • Waitstates can be jumper selected. • Compatible with CP/M and MP/M operating systems. • Bank select feature. • Write protect option.

Complete RAM CARD with 64k of RAM — $249
128k — $319 256k — $439

MULTIFLEX S100 64K STATIC RAM CARD

• Uses 2k x 8 static RAM chips. • Static RAM eliminates problems with refresh. • Optional provision for battery back up provides you with ideal way to store data even when the power is turned off.

Complete board with
4k RAM — $99 32k RAM — $250
16k RAM — $170 64k RAM — $399

Versadigital Signs

The sign that also talks

Every business needs attention. In today's competitive marketplace you need to get the customers' attention and you need to get your message across - as boldly and as dynamically as possible.

Two versions are available, single and double row. Each row holds up to 21 standard characters and can be expanded to up to 42 characters. The LED (Light Emitting Diode) display is available in red (standard or extra bright), green and yellow. Standard, wide (2", upper and lower case) and bold tall (4", upper case) come with the display. All can be displayed normally or in inverse (black characters on a lit background) image format. You can even program your own characters and graphic symbols. As well as the standard LED display, larger, brighter incandescent light bulb displays can be built to your specifications. All programming features are retained, and the standard LED display is included for ease of programming.

A wide variety of features allow you to catch the public's attention — choose from Wipe-On and Wipe-Off, Spell-On, Flash and Blink, Shift left and right, Scroll up and Down — in any order and at individually selectable speeds.

Up to six different events can be displayed simultaneously within dynamically selectable boundaries. Up to 128 labelled messages can be stored within the units memory for display at any preselected time and date and in any order. 12,288 character memory is standard on the Versadigital Display. This can be expanded to 36,864 with optional external read only memory modules.

Text can be entered through the Display's own keyboard, from an ordinary cassette recorder, from optional external memory modules, or optionally over telephone lines, radio or infra-red link or over AC wiring. A comprehensive set of commands allow complete control over the display's facilities. A powerful word processor type editor lets you easily write, edit, run, save (on cassette) and transmit messages.

Use It Alone . . .

Using the Display's own keyboard, you can enter messages, or modify old ones, any time you wish. You can create messages weeks in advance and store them on cassette for subsequent use.

You can program, say, a set of store specials to appear at selected times throughout the day and then just leave it alone. The Display's internal clock does the rest. You can even program it to turn itself off at night and back on in the morning. The Versadigital Display's optional voice capability ensures that your messages will be noticed as they come up.

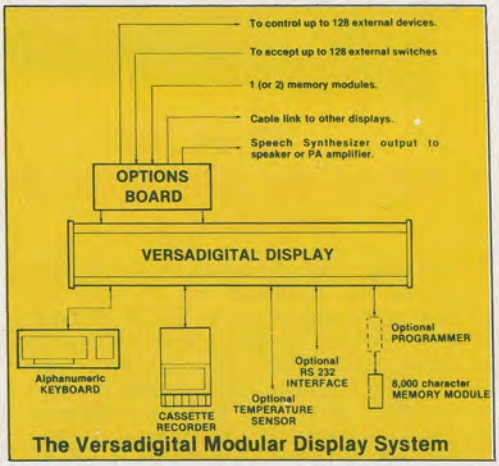
. . . Or Use a Lot Simultaneously

An optional link enables additional displays to echo a single central display, at distances of up to 4,000 feet. You can disperse displays around a bus terminal, shopping plaza or throughout a train and update them all by simply updating one.

Unprecedented Programming Flexibility

Versadigital offers a variety of methods for programming your Display. Aside from standard keyboard and cassette interface, the Display can be programmed (by means of an RS-232 port) via telephone lines, infra-red or radio link or over AC wiring. Ideal for multibranch use as it allows updating across the city, or across the country.

Versadigital signs are in use throughout the Toronto subway system. Send for reprint of article in Computing Now!, July 1984.



The Versadigital Modular Display System

Optional Programmable External Memory Modules expand the Display's internal memory and allow preprogramming weeks in advance. Unlike audio cassettes, these require no special reader, but can be plugged directly into the Display. One module can be added without modification, two more plus an options board expand the Versadigital's memory to a whopping 36,864 characters. Modules can be read directly by the Display, or programmed via an optional programmer module. Modules can be programmed weeks in advance and then mailed out to branches for displaying.

The modules are completely re-usable and are erased by a half hour's exposure to ultraviolet light.

The Sign That's Portable

The Versadigital Display can be optionally run from any 12 volt automobile supply. Take it on the road! To outdoor rallies, fairs and other events. Anywhere you can go, you can take the Versadigital Display with you.

The Sign That Can Sell Your Product

Research has shown that digital displays can increase sales by up to 30%. The Versadigital Display virtually assures that figure by increasing the readers' involvement. An optional interface allows up to 128 switches to be connected to the Display, enabling customers to select specific messages without having to wait for the sign to cycle through its repertoire.

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A revolution in sign technology

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Excelltronix

Multiflex Products

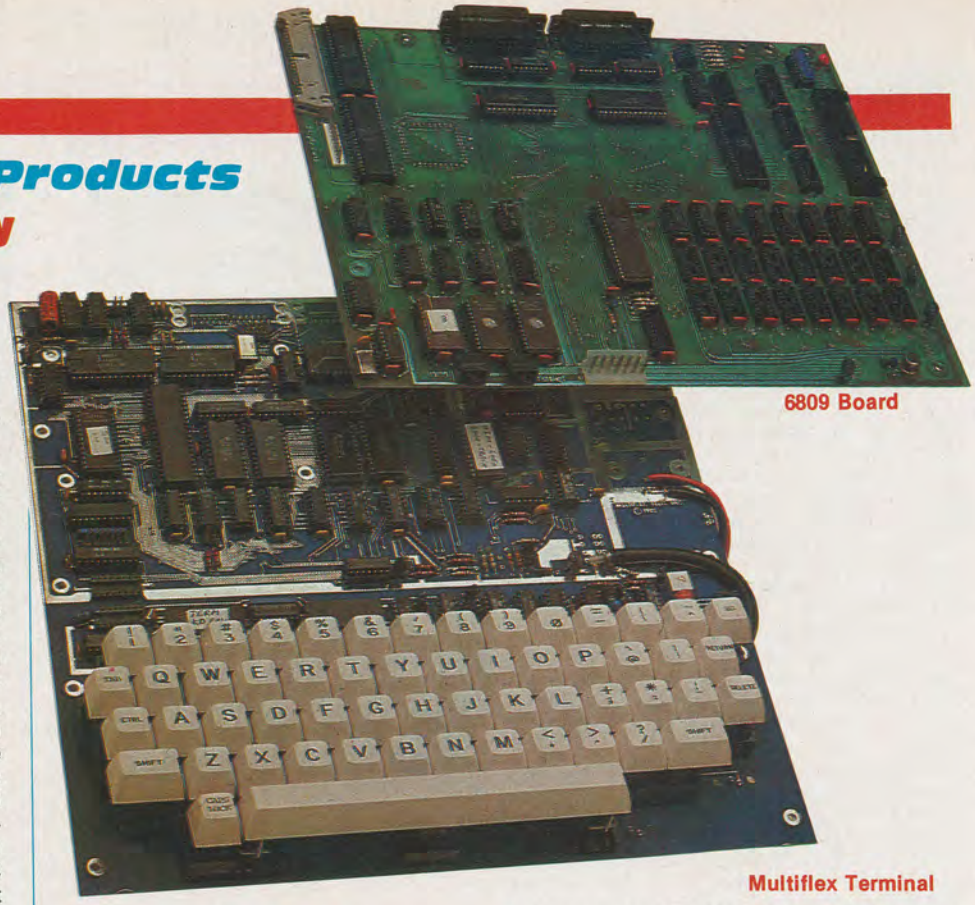
Multiflex Economy Video Display Terminal

Now available from MULTIFLEX is an economy video display terminal. Originally designed as a low cost access unit for our mail-ordering and bulletin board system, this terminal is a semi-intelligent system which is controlled by a Z80A microprocessor and a 6845 CRT controller chip. The keyboard is fully ASCII encoded and the character generator contains the full 128-character set as well as a 128-character alternate set both of which are in the 5x7 dot matrix format. The screen display is 80 characters by 24 lines if the unit is hooked to an external monitor. (Monitor not included). There are 3 software selectable attributes (dim, reverse video, and alternate character set) which can be chosen one at a time for the whole screen. The attribute can then be switched on and off for each individual character. A 2K buffer is provided for normal operation. However when the optional 6K memory upgrade is purchased, 4 screen pages can be loaded from the host machine, edited, locally, and then downloaded back to the host again saving on connect time and phone line bills. Also included are 2 RS232 ports: one for a modem and one so that a printer can be attached to the terminal. The baud rates on these ports are software programmable and can range from 110 to 9600 baud. With all these features, you would expect to pay a lot for this system, but all this is available to you, complete with an attractive case, for an extremely low price.

A&T board with keyboard (as picture top right) with one RS232 and 2K buffer
$169.00

Terminal Complete: Tested and 90 days warranty with 2 RS232 ports, 2K buffer case and power supply (Hydro approved)

$319.00



6809 Board

Multiflex Terminal

U of T 6809 Single Board Computer

The 6809 Single Board Computer, designed at the University of Toronto and distributed exclusively by EXCELTRONIX, is a compact hardware unit which was designed originally as a lab board for teaching students about microprocessor systems. Its many features, however, make it an ideal unit for stand-alone control applications or software development systems as well.

The system is designed around the Motorola MC6809 microprocessor. This is an 8-bit processor with full 16-bit internal architecture, 2 index registers, 2 stack pointers, 2 8-bit or 1 16-bit accumulators, a direct page register and a wide range of addressing modes, including a program-counter-relative mode. This mode allows the user to write completely position independent software, important in systems software development.

There is provision for up to 48K bytes of dynamic RAM on-board. The refreshing of this RAM is controlled by an 8202 Dynamic RAM Controller. This chip allows for completely transparant refreshing of the RAM (ie. no wait states to slow the system down). There is also provision for up to 12K of EPROM using 2532 chips.

There are 4 complete I/O circuits built onto the board. 2 of them are serial (RS232); one is used for a terminal (which is required for use of the board with the supplied monitor software), and the other one is user defineable, but it is set up to communicate with either a modem or a printer. Also on-board are 2 6522 VIA chips. These provide 2 parallel ports per chip along with 2 16-bit timer/counters. One of the parallel ports and one of the timers are use by the monitor software to provide a cassette interface (which operates at 300 baud). The second parallel port on that chip is wired into a connector which is ideal for interfacing a parallel printer or keyboard. The 2nd VIA is not used at all and is completely free for the user. For further expansion of the system, a fully buffered version of the CPU signals (data, address, control lines and a signal indicating whether or not the current address is located on the board) is available at a cable connector.

The software provided with the system is in a 2532 EPROM and allows the user to: test the memory; dump blocks of memory; examine and modify single memory locations; read or write from the cassette port; set and examine breakpoints; single step and/or execute machine language programs and set and examine the processor registers. All this is accomplished through a 9600-baud terminal interface (one of the serial ports) Included is a full screen editor/assembler which allows the user to work in 6809 assembly language rather than machine language. All this makes this board an ideal trainer, control unit or software development unit for just about anyone.

Includes U of T course documentation

A&T with 48K
$389

Special Pricing is available when both items on this page are purchased together

Eagle PC +XL – Same as the Eagle Plus, but with 10 megabytes of integrated hard storage. $5,980.00											
Eagle Spirit II	8088	128K	2 serial, 1 parallel	2-5¼" floppy	640x200 pixels	Yes	MS-DOS 2.1, BASICA	Eagle Computers	DataTech Systems Ltd., Leading Source	$4,065.00	Integrated 9" monitor
Eagle Spirit XL – Same as the Eagle Spirit, but includes integrated 10 megabyte hard drive. $5,980.00											
Eagle Turbo XL	8086 (8 MHz-4.77 MHz switchable)	256K	1 Parallel	1-5¼" floppy, 1 10 Mb hard	Opt. card..640x200 pixels	Opt. card	BASICA, MS-DOS	Eagle Computer	Datatech Systems Ltd Leading Source	$7,450.00	8 slots
Durango Poppy	80186 & 80286	384K	1 serial, 1 parallel	1-819K floppy, 1-10 Mb drive (optional 20 Mb or 40 Mb hard drive)	No	No	XENIX	Durango Systems Inc.	Norango Computer Systems Inc.	$5,700.00	14" monitor and station included
Chameleon	Z80 & 8088	128K	Serial & parallel	1-DS DD 5¼" floppy	320/640x200 pixels	Yes	WordStar, Super-Calc, Perfect Writer/Calc, MS-DOS, GWBASIC, Term	Seequa	York Computers	$1,995.00	9" monitor
Chameleon Plus	Z80 & 8088	256K	Serial & parallel	2 DS DD 5¼" floppy	320/640x200 pixels	Yes	Same as Chameleon but with Condor I & Perfect Speller	Seequa	York Computers	$2,695.00	9" monitor

Survey of PC Compatibles

Name	Processor(s)	RAM	Printer I/O	Disk Drives Inc.	Graphics	Colour	Software Inc.	Manufacturer	Available From	Suggested Retail	Other
Seequa PC	8088 & Z80	128K	Serial & parallel	1 DS DD 5¼" floppy	320/640x200 pixels	Yes	Same as Chameleon	Seequa Computer Corporation	Local Dealers	$1,995.00	9" monitor
Seequa XT	Z80 & 8088	256K	Serial & parallel; 4 expansion slots	1 DS DD 5¼" floppy 1-10 Mb hard drive	320/640x200 pixels	Yes	Same as Chameleon Plus	Seequa	York Computers	$5,500.00	9" monitor
BEE PC	8088 & Z80	128K	1 parallel & 2 serial	1-5¼" DS DD floppy	640x320 pixels	Yes	N/A	Bee Microsystems	Local dealers	$2,795.00	10 programmable function keys
Philips PC	8088	128K	Parallel & serial	2-5¼" floppy	640x325 pixels	Optional	Multi-Mate, GW BASIC, PC Tutor, MS-DOS	Corona	Philips Information Systems	$3,665.00; 256K version running MS-DOS 2.0 is $3,990.00	4 expansion slots. Monitor included
HAL	8088	128K	1 serial & 1 parallel	2 half-height 320K DS DD 5¼" floppy	640x320 pixels	Yes	N/A	HAL Computer Co.	HAL Computer Co.	$2,119.00	Full IBM PC compatibility with PROM purchase
STM Personal	80186 (8 MHz)	256K	1 parallel, 2 serial Integrated printer	2 720K (formatted) DS DD 5¼" drives	640x200 pixels colour, 720x348 pixels monochrome	Yes	MS-DOS, telephone/modem support	Semi-Tech Microelectronics Corporation	Local dealers	$3,699.00	Integ. auto-dial/answer modem, RGB/composite output
Otrona 2001	8088; opt. Z80B and 8087	128K	1 serial & 1 parallel	2 DS DD 5¼" floppy	640x200 pixels	Yes	Operating system	Otrona Advanced Systems Corp.	Scarsdale 500	$4,495.00	7" flat screen, portable
Solution 5000 PC	8088	128K; 256 K for portable model	1 serial, 1 parallel 5 slots	2 360K DS DD 5¼"	640x200 pixels	Yes	MS-DOS, Electric Pencil, K.I.S. Accounting, future packages free of charge	Ace Micro-Electronics Corp.	Ace Micro-Electronics Corporation	Prices start at $2,495.00	One year warranty
The Portable	8086	272K	1 serial, 1 HP-IL	RAM disk; opt. 710K 3½" floppy	480x128 pixels	No	Lotus 1-2-3, MS-DOS, P.A.M., WP, terminal	Hewlett-Packard	Hewlett-Packard	$4,598.00	
Zenith Z-160	8088	128K	2 serial, 1 parallel	1 or 2-5¼" DS DD floppy	Yes	Optional	MS-DOS, diagnostics	Heath/Zenith	Heathkit-Zenith	N/A	
HS-151	8088	128K	2 serial, 1 parallel IBM compatible slots	1 or 2-5¼" DS DD floppy	640x200 pixels	Yes	MS-DOS, diagnostic software	Heath/Zenith	Heathkit Electronics Centre	Kits: $2799.00 (1 drive) $3199.00 (2 drives)	Assembled: $3999.00 (1 drive), $4659.00 (2 drives)
HS-161 — Similar to the HS-151, but includes a 9" amber monitor. No list price available.											
TS 1605 Personal Computer	8088	128K	1 parallel, 1 serial	2 slimline DS DD ¼" floppy	640x200 pixels	Yes	TeleDOS, TeleBASIC	Televideo	Norango Computer Systems Inc.	$2,995.00 base	
Panasonic Sr. Partner	8088	128K	1 parallel, 1 serial	1 DS DD 5¼" floppy	Yes	Optional	WordStar, VisiCalc, pfs: File/Report/Graph, GW BASIC	Panasonic	Panasonic	N/A	Built-in printer, disk drive and expansion space
Advanced Personal Computer III	NEC 8086 (8MHz)	128K	1 parallel, 1 serial	1 or 2-5¼" floppy, or hard drive with 5¼" floppy	640x400 pixels; colour & monochrome	Yes	MS-DOS, GW BASIC	NEC	Micro Computers of Canada	$2,995.00 for 1 drive $5,995.00; hard drive version	Monitor included
North Star Dimension	80186	256K	1 parallel, 2 serial 13 slots	1-360K floppy; hard drives available	N/A	N/A	N/A	North Star Computers, Inc.	TRW Data Systems	$10,995.00	Up to 12 users
QCAL 8000	8088	128K	5 expansion slots	1 DS DD 5¼" floppy	N/A	Yes	N/A	QCAL International	Pacific Rim Electronic Imports	$2,295.00	
IBM PC AT	80286	256K;512K enhanced version	8 expansion slots; Serial/Parallel enhanced	1 1.2 Mb floppy Enhanced has same plus 20 Mb hard drive	640x200 pixels	Optional	Software in ROM	International Business Machines Corp.	Local IBM dealers	$6,149.00; $8,915.00 enhanced	
Compaq Portable	8088	256K	1 parallel, 3 expansion slots	2-5¼" 320K DS floppy	640x200 pixels	RGB & composite interfaces. Requires colour monitor	MS-DOS, Microsoft BASIC	Compaq Computer Corporation	Micro-Lewis	$4,495.00	Built-in 9" monochrome monitor

Compaq Plus	8088	256K	1 parallel, 2 expansion slots	1-5¼" 320K DSDD floppy, 1 10 Mb hard	640x200 pixels	RGB & composite interfaces. Requires colour monitor.	MS-DOS 2.0, BASIC 2.0	Compaq Computer Corporation	Micro-Lewis	$7,495.00	Built-in 9" monochrome monitor
Compaq Deskpro Model 1	8086	128K	Parallel, 6 expansion slots	1-360K 5¼" drive	640x200 pixels	Yes, w. sep. colour monitor or TV	MS-DOS	Compaq Computer Corporation	Micro-Lewis	$3,360.00	Monitor included RGB, composite and RF interfaces
Compaq Deskpro Model 2	8086	256K	1 parallel, 6 expansion slots	2-360K 5¼" drives	640x200 pixels	Yes, w. sep. colour monitor or TV	MS-DOS	Compaq Computer Corporation	Micro-Lewis	$4,110.00	
Compaq Deskpro Model 3	8086	256K	1 parallel, 1 asynchronous communications	1-360K 5¼" floppy, 1 10 Mb hard	640x200 pixels	Yes, with sep. colour monitor or TV	MS-DOS	Compaq Computer Corporation	Micro-Lewis	$7,110.00	
Compaq Deskpro Model 4	8086	640K	1 parallel, 1 asynchronous communications	1-360K 5¼" floppy, 1 10 Mb hard, 1-10 Mb backup	640x200 pixels		MS-DOS	Compaq Computer Corporation	Micro-Lewis	$10,410.00	
Visual Commuter	8088	128K	1 parallel, 1 serial	1-360K 5¼" floppy	N/A	Yes, colour monitor needed. Has RGB, RF & composite output	MS-DOS 2.1, GW BASIC	Visual Computer Incorporated	Nelma Data Corporation	$2,695.00	
Aftek PC/PC+	8088	128K	1 parallel, 8 slots	1 DS DD 5¼" floppy PC+ has 2	Opt. card	Opt. card	Operating system	Aftek Business Machines, Inc., Willowdale	Local dealers	$2200.00 PC + retails for $2600.00	Monitor optional
Aftek XL/DL	8088	256K	1 parallel, 1 serial slots	1 DSDD 5¼" floppy, 1-10 Mb hard. DL has tape backup	Opt. card	Opt. card	Operating system	Aftek Business Machines, Inc., Willowdale	Local dealers	$4,800.00; DL retails for $6,900.00	
Apricot PC	8086; I/O through an 8089	256K	1 parallel, 1 serial	1-315K 3½", 2-315K 3½" or 2-720K 3½" floppy drives	800x400 pixels	Opt. card/ monitor req	MS-DOS 2.1,CP/M-86, Concurrent CP/M, Personal BASIC, MBASIC, communications, Super-Writer/Calc/Planner	Applied Computer Techniques, Britain	Western Cash Register	$3,350.00 (1 drive); $3,650 (2-315K drives) $4,150.00 (2-720K drives	800x400 pixels requires monitor purchase
Apricot Xi	8086; I/O through an 8089	256K	1 parallel, 1 serial	1-315K 3½" floppy & 1-5 Mb hard drive or 1-720K 3½" floppy & 1-10 Mb hard	800x400 pixels	Opt. card/ monitor req	MS-DOS 2.1, CP/M-86, Concurrent CP/M, Personal BASIC, MBASIC, communications, Super-Writer/Calc/Planner	Applied Computer Techniques, Britain	Western Cash Register	$5,700.00 for 5 Mb model, $6,400 for 10 Mb model	
Apricot F1/F1e	8086	128K (F1e) 256K (F1)	1 serial, 1 parallel	1 315K 3½" floppy (F1e), or 1-720K 3½" floppy (F1)	640x256 pixels	Yes, with either TV or RGB monitor hookup	Operating systems, Personal BASIC, Doctor, Logo, tutorial	Applied Computer Techniques, Britain	Western Cash Register	$1,985.00 (F1e); $2,445.00 (F1)	Optical link to keyboard
Apricot Portable	8086 (at 5 MHz)	256K	1 serial, 1 parallel	1-720K 3½" floppy	640x200 pixels	Yes, with sep. RGB monitor	Operating system, voice recognition software, more	Applied Computer Techniques, Britain	Western Cash Register	$4,125.00	
Mega-Board	8088	64K	8 slots	1 DSDD 5¼" floppy	Opt. card	Yes, with colour monitor	Mega-BIOS	Display Telecommunications Corporation	Parts Galore, Inc.	$1,995.00 (minimum system)	

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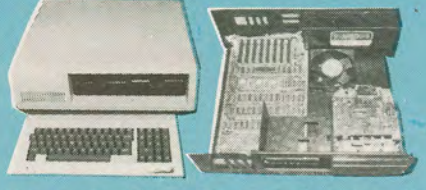

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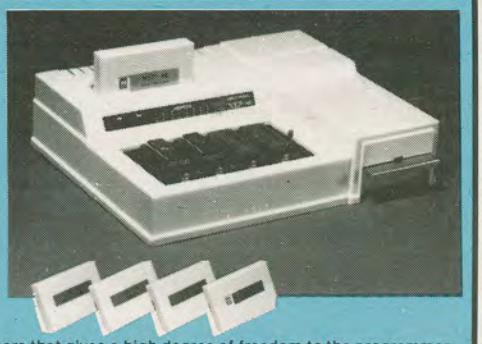

The VEP 46 is a totally new concept in EPROM programmers that gives a high degree of freedom to the programmer. Software supplied allows access to the entire memory array of the host computer so that sections of ROM can be examined, moved, edited, and copied to up to 4 EPROMS at one time. Novel BIOS programs can be composed and tested easily and rapidly, the built-in UV lamp allows erasure of up to 10 EPROMS at one time in 20 minutes. Any 5 V EPROM, with few exceptions can be programmed. Currently host adaptors are available for the Apple and IBM machines with Commodore to be ready soon. The VEP 46 comes with an extensive manual with step by step instructions showing how to do everything simply and easily. Some features are:

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- Verifies up to 4 blank EPROMS
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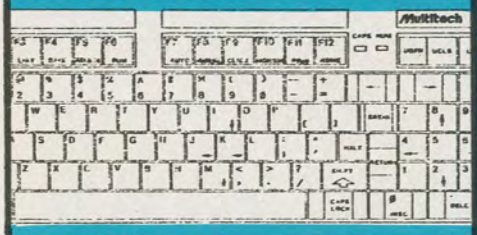

The MAK-II is a very good separate keyboard that uses serial data transfer (like the IBM) for the lowest error rate possible. This keyboard has 10 user definable keys and has 64 pre-coded macros for single stroke entry of most basic commands, plus auto-line-number and selectable key clicks. A really feature packed keyboard $169.95

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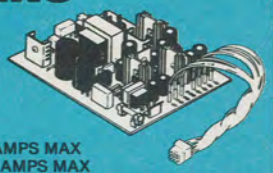

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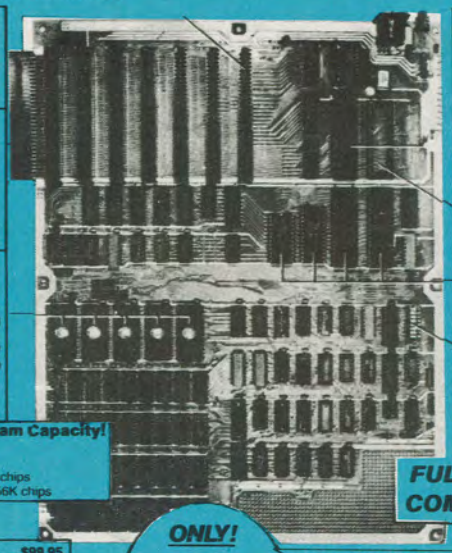

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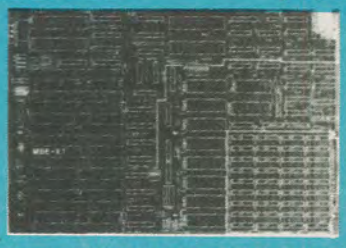

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A Voice for the PC

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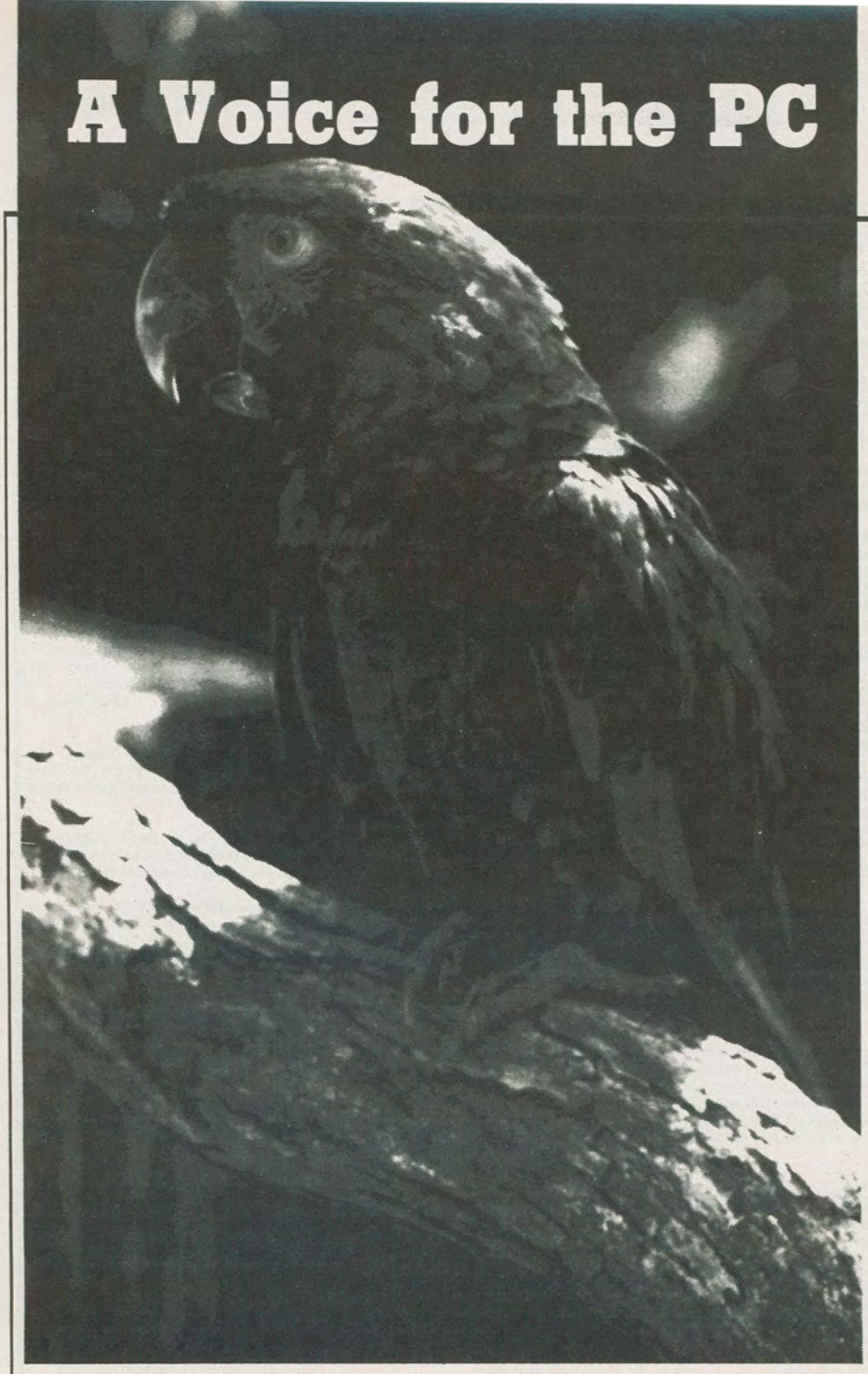

Talk, talk, it's only talk... babble, burble, banter... However, when it comes from within the fiberglass heart of your IBM it takes on a whole new scope. Build this simple speech card and give your blue box a voice.

by Brian Greiner

Just about every movie and television show these days has a robot or computer that talks. In their cool, logical voice they announce the end of life as we know it, nuclear war, tax audits and other catastrophic events. My PC has been on my back for months for the capability of doing the same thing. After all, fair's fair... I've screamed at it often enough, so it should at least be able to audibly sneer at me when it goes berserk.

After considerable argument over this... I lost, probably a testament to the sophistication of contemporary operating systems... I started looking around for suitable peripheral boxes and found, not surprisingly, that they started at a not insubstantial fraction of my entire net worth... and more for ones that actually worked.

I decided that the only recourse was to build a speech card. This wasn't a lot more fruitful at first... speech chips are anything but cheap. One of the more popular ones, the Votrax SC 01, costs in the order of fifty dollars US and is available only in the US when it's available at all.

At The Shack

My quixotic search for babbling silicon came to an end in the middle pages of a Radio Shack catalog, deep in the very tiny print, wherein it was noted that virtually any Radio Shack store in creation will happily cough up a complete voice synthesis chip set. Living under the alias of catalog number 276 1783, it costs a mere eighteen bucks.

Now, this thing isn't exactly Knowlton Nash with pins. It's meant primarily for talking clock applications. However, it's affordable and available and, while not as sophisticated as it might be it's easy to implement.

Picking up my trusty pencil, I consulted my ouija board and drew up the circuit in figure one. Note that the bulk of the cir-

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Modem7. Allows you to communicate with any CP/M based system and download files. Complete details were in Computing Now! November 1983.

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STOCKS. This is a complete stock management program in BASIC.

SEE. Also known as TYPE17, will TYPE any file, squeezed or not allowing you to keep documents in compressed form while still being able to read them.

Order as AFS #1 and specify system

BISHOW. Th ultimate file typer, BISHOW version 3.1 will type squeezed or unsqueezed files and allow you to type files which are in libraries (see LU, below). However, it also pages in both directions, so if you miss something, you can back up and see it again.

LU. Every CP/M file takes up unnecessary overhead. If you want to store lots of data in a small space, you'll want LU, the library utility. It permits any number of individual files to be stored in one big file and cracked apart again.

RACQUEL. Everyone should have one printer picture in their disk collection.

MORTGAGE. This is a very fancy mortgage amortization program which will produce a variety of amortization tables.

NSBASIC. Large disk BASIC packages, such as MBASIC, are great... and very expensive. This one, however, is free... and every bit as powerful as many commercial programs. It's compatible with North Star BASIC, so you'll have no problem finding a manual for it.

Z80ASM. This is a complete assembler package which uses true Zilog Z80 mnemonics. It has a rich vocabulary of pseudo-ops and will allow you to use the full power of your Z80 based machine... much of which can't be handled by ASM or MAC.

VFILE Easily the ultimate disk utility, VFILE shows you a full screen presentation of what's on your disk and allows you to mass move and delete files using a two-dimensional cursor. It has heaps of features, a built-in help file and works extremely fast.

ROMAN. This is a silly little program which figures out Roman numerals for you. However, silly programs are so much fun...

CATCHUM. If you like the fast pace and incredible realism of Pacman, you'll go quietly insane over Catchum... which plays basically the same game using ASCII characters. Watch little "C's" gobble periods while you try to avoid the deadly "A's"... It's a scream.

Order as AFS #2 and specify system

OIL. This is an interesting simulation of the workings of the oil industry. It can be approached as either a game or a fairly sophisticated model.

CHESS. This program really does play a mean game of chess. It has an on-screen display of the board, a choice of colours and selectable levels of look ahead.

DEBUG. The DDT debugger is good but this offers heaps of facilities that DDT can't and does symbolic debugging... it's almost like being able to step, trace and disassemble through your source listing.

DU87. The older DUU program does have some limitations. This version overcomes them all and adds some valuable capacities. It will adapt itself to any system. You can search, map and dump disk sectors or files. It's invaluable in recovering damaged files, too.

ELIZA. This classic program is a micro computer head shrinker... It runs under MBASIC, and, with very little imagination, you will be able to believe that you are conversing with a real psychiatrist.

LADDER. This is... this program is weird. It's Donkey Kong in ASCII. It's fast, bizarre and good for hours of eye strain.

QUIKKEY. Programmable function keys allow you to hit one key to issue a multi-character command. This tiny utility allows you to define as many functions as you want using infrequently used control codes and to change them at any time... even from within another program.

RESOURCE. While a debugger will allow you to disassemble small bits of code easily enough, only a true text based disassembler can take a COM file and make source out of it again. This is one of the best ones available.

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PCWRITE. While not quite Wordstar for nothing, this package comes extremely close to equalling the power of commercial word processors costing five or six bills. It has full screen editing, cursor movement with the cursor mover keypad, help screens and all the features of the expensive trolls.

SOLFE. This is a small BASIC program that plays baroque music. It's also a fabulous tutorial on how to use BASICA's sound statements.

PC-TALK. A Telecommunicatons package for the IBM PC which does file transfers in both ASCII dump and MODEM7/X-MODEM protocols and comes with... get this... 119424 bytes of documentation.

SD. This sorted directory program produces displays which are a lot more readable than those spewed out by typing DIR.

FORTH. This is a small FORTH in Microsoft BASIC. You can build on the primitives intregral with the language.

LIFE. An implementation of the classic ecology game written in 8088 assembler.

MAGDALEN This is another BASIC music program.

CASHACC. This is a fairly sophisticated cash acquisition and limited accounting package written in BASIC. It isn't exactly BPI, but it's a lot less expensive.

DATAFILE. This is a simple data base manager written in... yes, trusty Microsoft BASIC.

UNWS. Wordstar has this unusual propensity for setting the high order bits on some of the characters in the files it creates. Here's a utility to strip the bits and "unWordstar" the test. The assembler source for this one is provided.

HOST2. This is a package including the BASIC source and a DOC file to allow users with Smart-Modems to access their PC's remotely. It's a hacker's delight.

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A Voice for the PC

cuitry is for interfacing to the PC's buss and for decoding the I/O signals. For those lazy souls among us who don't want to wire up all that messy interface circuitry, I recommend the use of the Real Time Devices' PD100 prototype board, as encountered elsewhere in this issue. It has all the interface circuitry as well as lots of prototyping area.

The voice chip is actually a General Instruments SP0256 AL2, with a library ROM SPR016. We'll speak more about these chips a bit later. The chip requires a clock signal of 3.12 megahertz, typically supplied by a crystal of that frequency. It being Sunday by the time I noticed this... of course I hadn't bought the stupid crystal... I decided to use the clock outputs on the PC's buss. There is a 4.77 megahertz signal on buss pin B20, which when divided by two through a flip flop gives 2.38 megahertz.

This produces a rather bassy, slow drawl sort of speech, and, unless you like barrel chested Texans on Valium it's a bit laconic to be of any practical use.

There is, however, a lesser known 14.31818 megahertz signal on buss pin B30, which when divided by four through two flip flops leaves one with 3.58 megahertz. This gives the chip, U8 in figure one, a voice that is a bit high and fast, but good enough for most purposes.

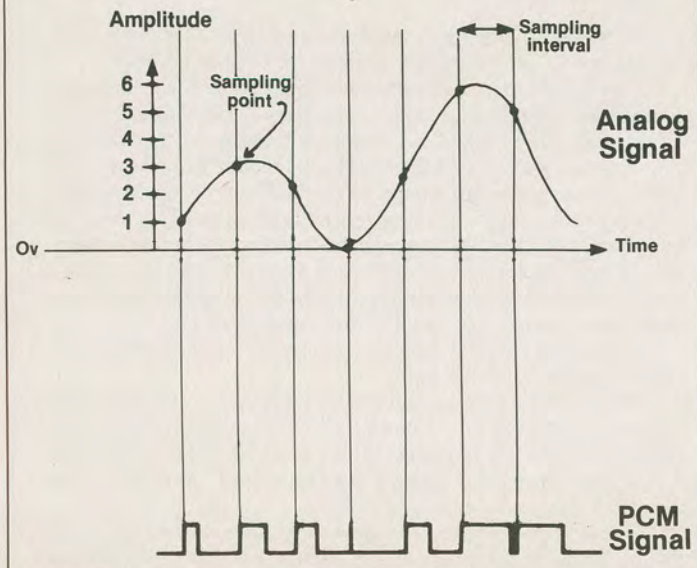
Chip U7 is the divider circuit. It's a D type flip flop set up as two divide by two counters.

The Small Bits

The LRQ, load request, output of the SP0256 is a status signal that goes low when the chip is ready to accept data. The ALD, address load, signal is a negative pulse that loads data into the chip. Strictly speaking, I should have used a tri-state buffer on each of U8 and U10 to make sure the signals were isolated from each other. However, the thing works without them, saving several packages.

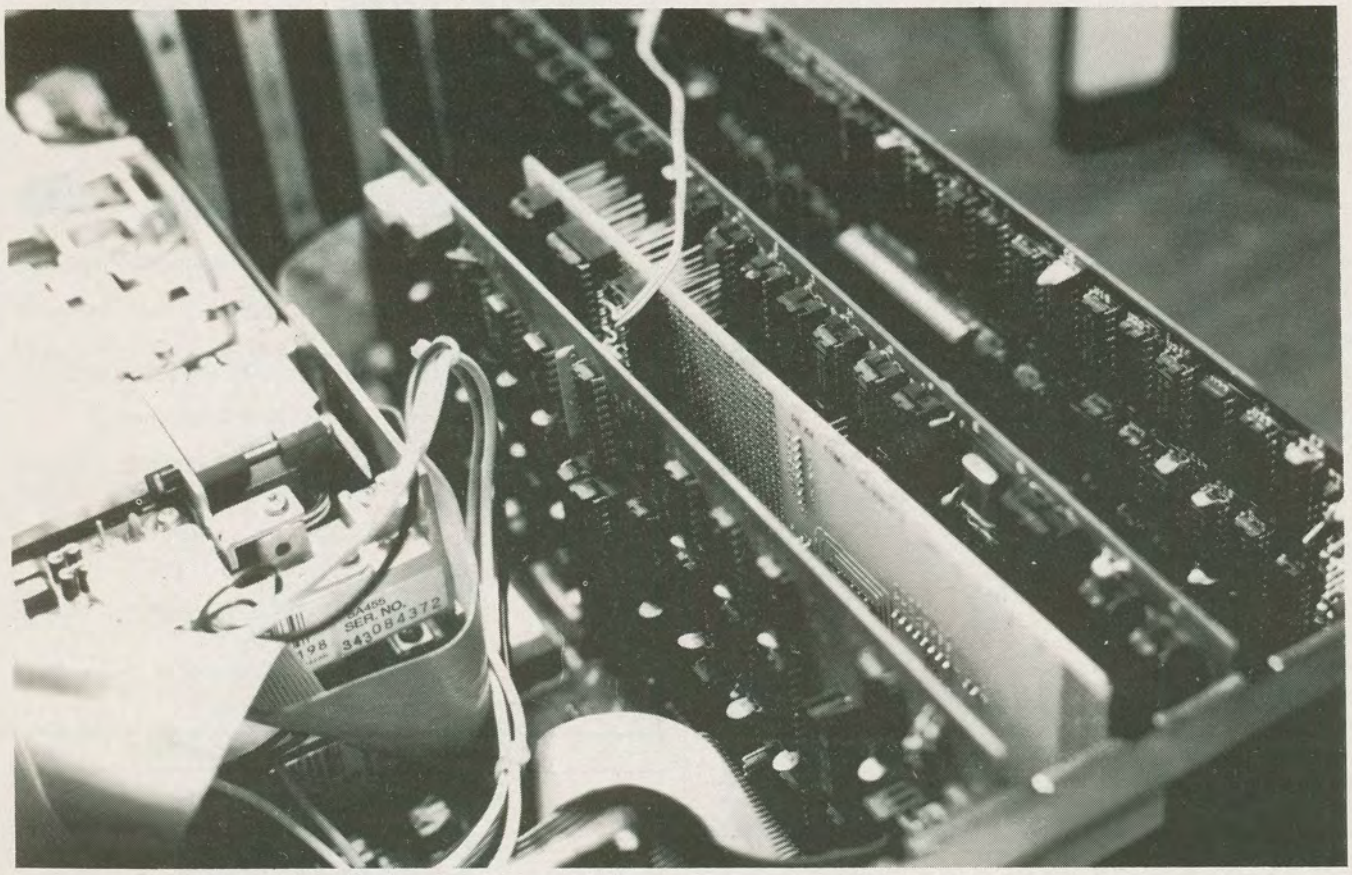
In my prototype, I hooked up U8 to the OUT0 select line, and U10 to the INP0 select line, with both S1 and S2 open. Thus, the port address for both outputting data and reading the status bit is 536 decimal.

The output of the speech chip is pulse width modulated. That is, it is a square wave whose width varies according to the intensity of the signal, as is illustrated in figure two. This means that the



The speech waveform produced by the card.

A Voice for the PC



signal must be sent through a low pass filter with a pass frequency of five kilohertz or so.The filter removes the high frequency carrier, the square wave, leaving the modulating waveform, the analog information we want. I took the easy way out, sending the signal into my stereo system, and played with the bass and treble controls until I got a sound I liked.

Most voice synthesizer cards have LM386 type drivers pumping into dime sized speakers, which renders their quasi-human sounds as something resembling the last gasps of a house cat with a half a bottle of gin in it. You can include one of these things in the circuit if you must... Radio Shack sells several suitable chips, with the appropriate circuits attached. However, as this is supposed to be a *speech* synthesizer rather than a *squawk* synthesizer, I heartily recommend the stereo approach.

Hit It, Blue Eyes

Using the synthesizer is very simple... largely because, as towering intellects go, the synthesizer itself is very simple. Output a number into its port between zero and thirty-five and it talks. A simple program that goes through all the entire vocabulary is as follows:

```
10 FOR I = 0 TO 35     'say each word one by one
20 OUT 536,I     'say a word
30 A = INP(536)     'check the status bit
40 IF A = 233 THEN GOTO 30     'if the bit is hi, loop
50 NEXT I     'if the bit is lo, go on
60 STOP     'all done
```

Note that in line forty I check the status line, LRQ, the least significant bit of the byte. As long as the status bit, LRQ, is high, the SP0256 is unable to accept new data. You may remember what I said about buffering the signals. If the circuit were properly buffered, the comparison word would have been two fifty five, that is, all bits of the byte set high. As it is, some of the bits are held low by U8. I got the actual comparison number by simply asking BASIC,

```
PRINT INP(536)
```

This gave me the data word when LRQ is LOW, so I simply added one to get the proper number for the test number.

The vocabulary of the speech synthesizer is fairly limited, as is outlined in table one. The vocabulary is determined by the ROM chip. The SP0256 was designed for mass production items and I've only seen it sold through Radio Shack. From what I can gather, the speech chip is capable of stand alone operations, having sixty-four allophones preprogrammed into it. However, using it without its ROM requires that one write software which selects each allophone in every word the nasty thing is supposed to say. General Instrument apparently has a special manual to assist one in doing this, but it's been hard to track it down.

Having had so little trouble locating the chip I don't mind a continuing quest for the book.

While not the most versatile speech synthesizer available, this little card is simple to put together and a lot of fun.In addition, the parts are very easy to come by, not a trivial matter when most things more specialized than a transistor want an order of ten thousand units and a ninety day wait.

I would like to figure out how to make a new ROM for it, though.There is so much else it should be able to say. How

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B1	GND

IC	Description	+5V	GND
U1	75LS30	14	7
U2	74LS02	14	7
U3	74LS245	20	10
U4	74LS04	14	7
U5	74LS155	16	8
U6	74LS86	14	7
U7	74LS74	14	7
U8	SPO256	7,23	1
U9	SPR-16	11	1
U10	74LS32	14	7

Decoder Address		Range in Decimal							
S1	S2	$\overline{OUT}$				$\overline{INP}$			
		0	1	2	3	0	1	2	3
OPEN	OPEN	536	537	538	539	536	537	538	539
OPEN	CLOSED	792	793	794	795	792	793	794	795
CLOSED	OPEN	600	601	602	603	600	601	602	603
CLOSED	CLOSED	856	857	858	859	856	857	858	859

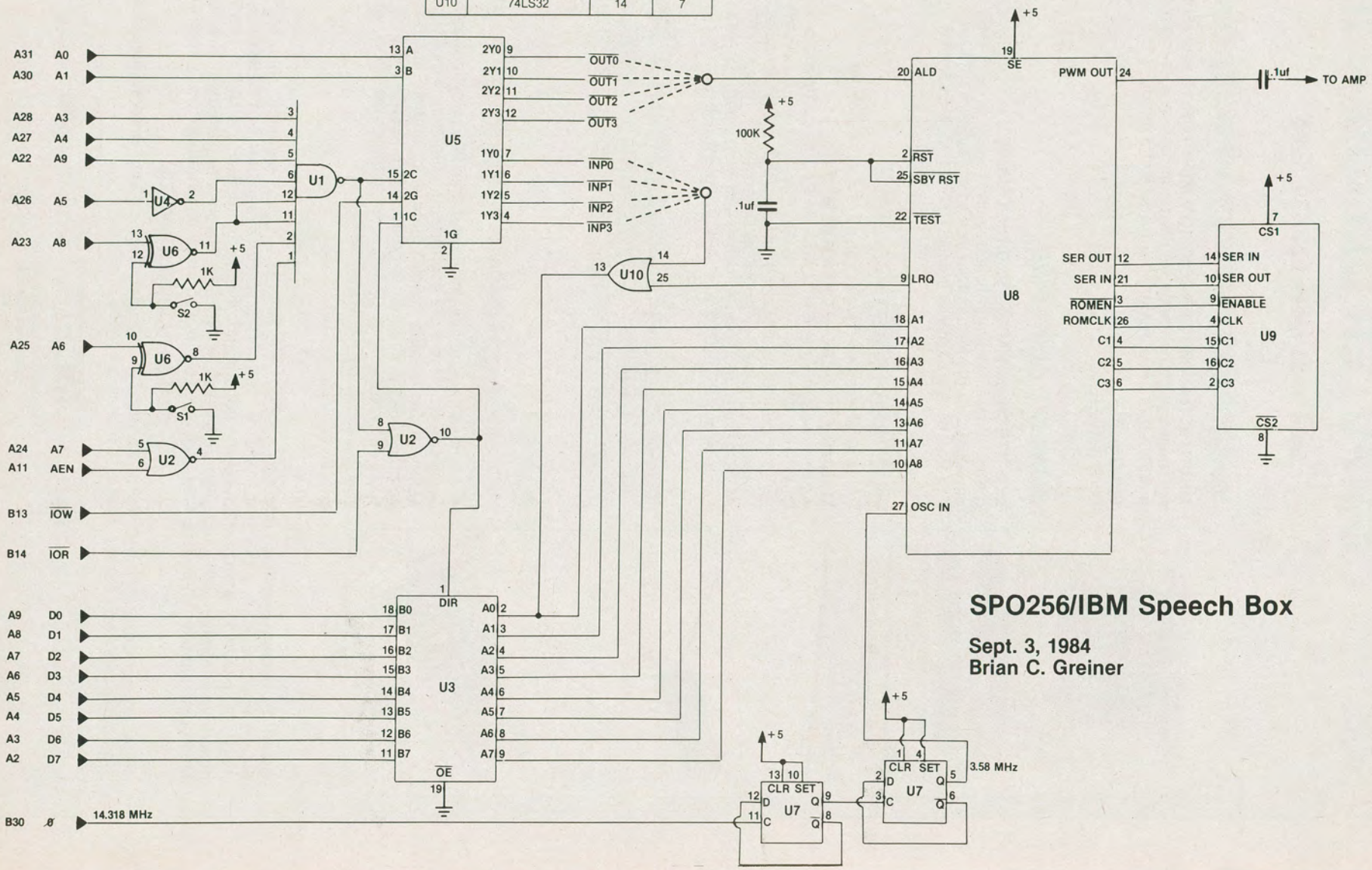

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Table One

Data	Word		
0	oh	18	eighteen
1	one	19	nineteen
2	two	20	twenty
3	three	21	thirty
4	four	22	forty
5	five	23	fifty
6	six	24	it is
7	seven	25	a.m.
8	eight	26	p.m.
9	nine	27	hours
10	ten	28	minutes
11	eleven	29	hundred hours
12	twelve	30	good morning
13	thirteen	31	attention please
14	fourteen	32	please hurry
15	fifteen	33	Big Ben chimes
16	sixteen	34	Dixie (opening notes)
17	seventeen	35	Dixie (closing notes)

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about... "imminent disk error" or "gimme more RAM or your program crashes" or "hello... there is no one home right now so this human will talk to you." The possibilities are frightening. **CN!**

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New Tricks for an Old DOS

You can limp through MS-DOS 2.0 with the feeble supply of commands you garnered under the older DOS one, but, with very little mental gasket strain you can actually have complete mastery over this powerful operating system.

by Steve Rimmer

A while back there was quite a lot of talk about MS-DOS version two being released. Users who had been impressed with the facilities of MS-DOS version one over the traditional eight bit operating systems... for which one would normally read CP/M... figured that an enhancement that was worth a whole number change had to be something to dance about.

In fact, MS-DOS 2.0 *is* a considerable party. However, its enhancements lie not in improved speed or slicker control codes... it leans pretty heavily on the original MS-DOS for these things, maintaining pretty fair compatibility with its ancestors. No, the real happening is in a wholly new directory structure and a forty gallon drum full of new commands and keywords.

Now, the result of all this, for most users, is that all their disks boot and say DOS 2.0. Few users of the PC's pet operating system ever make much use of the enhanced features of this new software. This is a understandable to an extent, because the facilities provided for them seem a bit obscure, especially if you've gotten used to the fairly linear approach to peripheral taken by CP/M style structures.

However, the new toys are manifestly useful once you get into them. We're going to have a look at some of the bits in this feature. Assuming that you already understand the original MS-DOS, this should help you to better apply the version two stuff, and to impress the cat.

Undetected Enemy Subs

The most important feature of DOS 2.0 is its ability to handle what are called *sub-directories*. The usefulness of this may escape you initially, especially if you have never experienced anything larger than a floppy disk as a form of mass storage.

On the other paw, sub-directories are like a cattle prod in a crowded elevator for users who own hard drives. They allow you to manage huge numbers of files without getting crushed into a singularity by the sheer numbers of file names.

If you create a disk and put some programs on it, it is usually fair to say that each program will have its own collection of files and utilities about it which don't really have much to do with any of the other programs and files.

Under version one of DOS, all these files would show up on the disk when one typed DIR, and if there were fifty or sixty of them the screen would scroll on for several pages. Under one of the hard drive versions of DOS, even a wide listing would create visual wallpaper for several minutes. This much data, blasting across your orbs as you look for the text file of the letter you wrote last week, is largely meaningless.

New Tricks for an Old DOS

Consider that your disk contains the following stuff. To begin with, you have a word processor, which in turn has a couple of overlay files and five or six text files. You also have a data base manager with a few overlays of its own and some data files. Finally, we'll hypothesize a C compiler, with its inherent passes, an assembler, a few library files and the resulting programs.

None of these groups has the least bit of use for any of the others. As such, MS-DOS version two allows you to separate them. All your nimble fingers need do is to create yourself some new directories, one each for each of these applications. There's even a command for this. It's called

MKDIR

The MKDIR command is a built in function of DOS. In fact, we'll find that this version of DOS has rather a large number of built in life forms. If you say

MKDIR\ LIFEFORM

DOS will open up a new directory called LIFEFORM. It will crop up on the file listing as a file name with DIR after it.

You can put files in a directory. The easiest way is to use COPY. The following one act play will copy all the .COM files on the disk into the directory LIFEFORM... assuming you've created ol' LIFEFORM as a directory first.

COPY *.COM LIFEFORM

Having put some files into the new sub-directory, you may want to actually *do* something with them. Hey, we all get these ideas from time to time. There are, in fact, two ways to do this.

You can access files from outside a sub-directory along its *command path*. In the process of playing around before I wrote this article I created a short text file called HERMIT, into which I typed "There once was a hermit named Dave..." Decorum prevents me from continuing. I placed this in a sub-directory called CAVE. In order to TYPE the file I could issue the command and path

TYPE CAVE\HERMIT

It's also possible to log yourself into a sub-directory. The proper command is CHDIR, for *change directory*, but CD also works, requiring three fewer bashes upon the keyboard.

It's important to note that when you first boot MS-DOS, you get logged onto drive A: and you also get bopped into what is called the *root* directory. This is the main directory, the list you see when you type DIR. You can imagine the subdirectories radiating out from this, rather like the branches of a tree. In fact, the word TREE is quite important to MS-DOS. We'll get to that in a while.

To move into a subdirectory, you must move along a branch. This requires a command path too. To move into the LIFEFORM directory, we would say

CD\LIFEFORM

Once in the LIFEFORM directory one could type DIR and, like the special effects from 1957 B horror movies, all the files in the root directory would appear to be gone. However, there would be a few new ones. To begin with, there are two housekeeping files in every subdirectory, called by their friends *dot* and *two dots*, as that's how they show up on the tube. These hold the information needed to keep track of what's in the directory. If we copy any files into the directory these will show up too.

If you're into structures and an ordered cosmos you are probably wondering how many levels of sub-directories MS-DOS allows for. The answer is "approximately a lot". While in the LIFEFORM directory we could issue the command

MKDIR\ALIENS

and the subdirectory LIFEFORM would contain a sub-subdirectory called ALIENS.

The ALIENS directory can be accessed from LIFEFORM in the same way that LIFEFORM would be accessed from the root directory. However, it can also be accessed from the root itself by the issuance of a more involved path. If the file HERMIT existed in ALIENS we could sit smugly in the root directory and say

TYPE\LIFEFORM\ALIENS\HERMIT

which would reach down through the subdirectories and grab the HERMIT file.

Finally, with all this facility for filling up your disks with directories you may find some solace in knowing that there is a way of snuffing off unwanted directories. The command

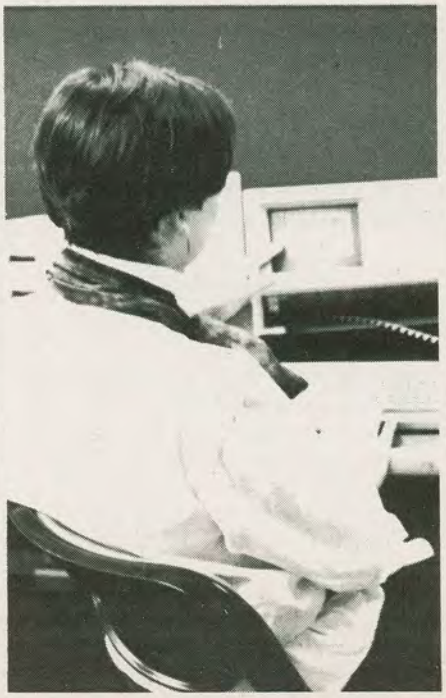
RMDIR\LIFEFORM

would remove the directory LIFEFORM. However, in order to do this, we would have to have emptied it of all its files and used the RMDIR command to behead the ALIENS sub-subdirectory it contained. Furthermore, RMDIR cannot be used if you are in the directory you are trying to kill, thus keeping one from conceptually cutting off the limb upon which one is crazy glued. As such, you can't RMDIR the root directory, cutting yourself off from creation.

If you chanced to check out the October edition of Software Now!, you may have noticed that this structure... and some of its commands... bears a striking resemblance to the UNIX operating system. There's a very good reason for this. CP/M, which is what the original MS-DOS was largely derived from, is a microcomputer oriented operating system designed to handle a few files, finite I/O and relatively little storage. However, the PC is a very powerful micro. An expanded one compares favourably to what used to be regarded as a mainframe system. The UNIX operating system was designed to make sense of a computer of larger dimensions. It seems like a reasonable step to scoff some of its bits for the operating system of the PC.

Other Toys

In addition to its facility for making order from chaos with directories, the version two of MS-DOS allows for a plethora of other



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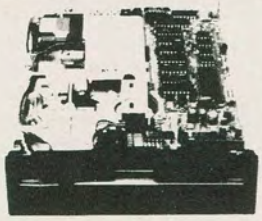

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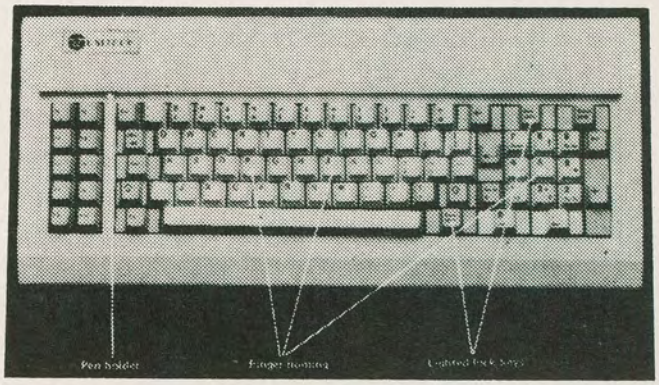

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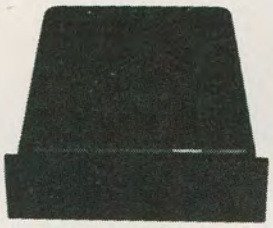

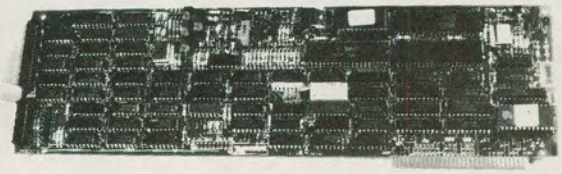

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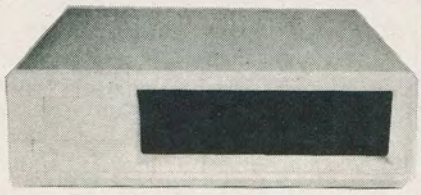

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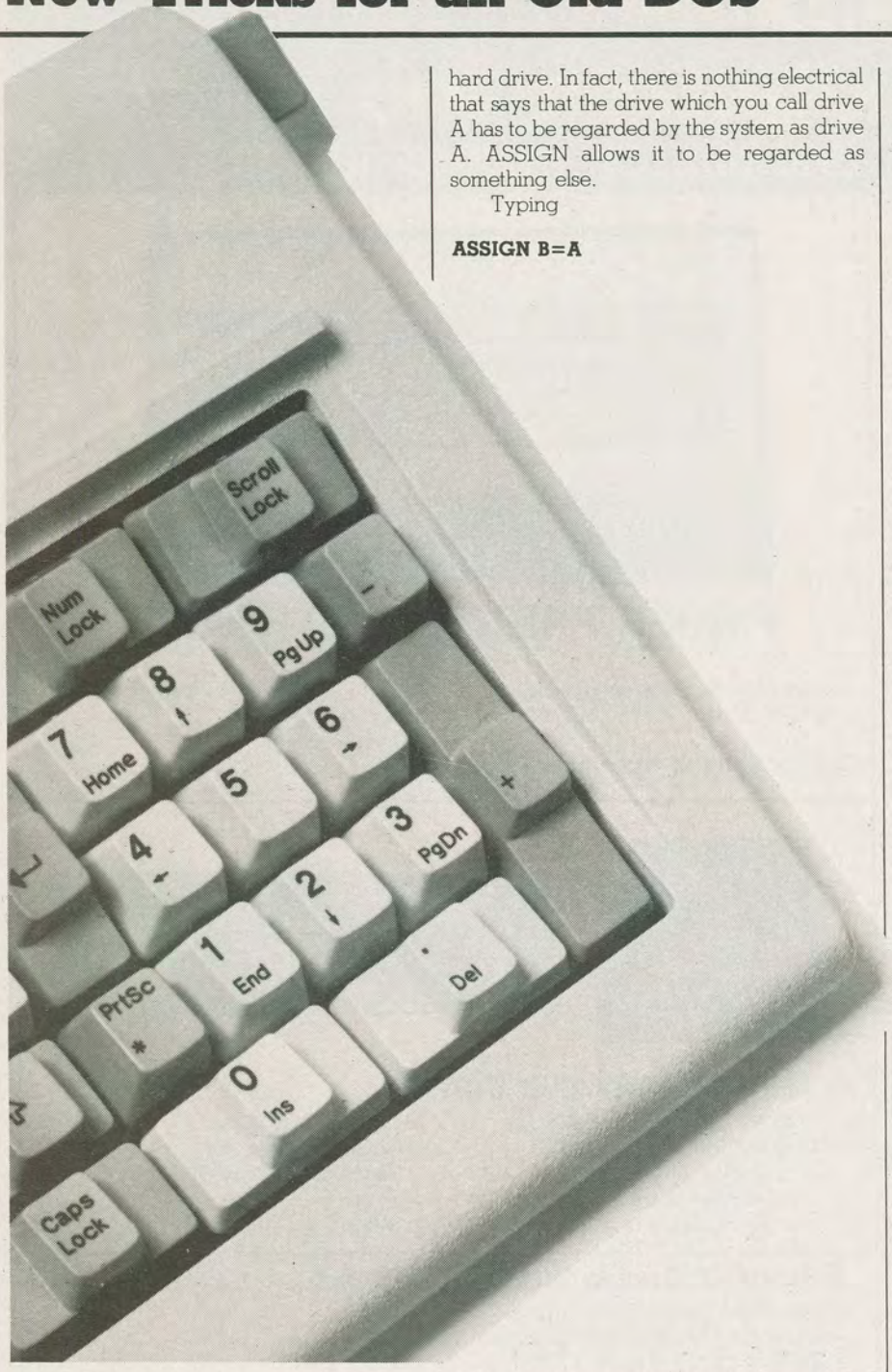
New Tricks for an Old DOS



commands sure to be described on a large illustrated poster sooner or later. It's hard to know where to start to look at these but, since the manual is arranged alphabetically, I think we'll commence with ASSIGN.

It is often the case that one will have a program which will insist on using one drive when you know full well that you'd be a lot happier if it were using another. This becomes more common if you have lots of physical disks, such as two floppies and a hard drive. In fact, there is nothing electrical that says that the drive which you call drive A has to be regarded by the system as drive A. ASSIGN allows it to be regarded as something else.

Typing

ASSIGN B=A

will cause the operating system access drive A even if you tell it you want something from drive B.

One of the really unused aspects of MS-DOS is its capacity for batch file processing. Batch files are a lot like shopping lists, except that you don't have to stand around figuring out which brand of moustache wax costs less per gram when it's bought and sold in ounces.

If you create a file called WAX.BAT and fill it full of the following lines

MKDIR/DWARF
COPY BANDIT.BAS DWARF
DIR/DWARF

you will have given birth to a brand new command called WAX. If you type WAX at the command prompt all of the things that are contained in the file will come to pass. You can hit control break while a batch file is executing and the system will ask you whether you want to stop batching and get on with other things.

If you name your batch file AUTOEXEC.BAT the computer will execute it every time you boot DOS, prior to going on to other things. As such, you can use this facility to make turnkey disks by simply creating a file with the name of the program whose key you want to turn.

Batch files actually have their own little languages to make batch processing more flexible. While not exactly BASIC in a box, you can include within your batch files pseudo-instructions which allow you to control the order and iteration of the real commands you've slipped in there.

In the normal course of affairs batch files cause the commands being executed to be printed on the screen after a string of command prompts as if you were typing them in by hand. You may not want this to happen, in which case you can insert the command ECHO OFF. The command ECHO MY BRAIN HURTS will print the message MY BRAIN HURTS even if the echo mode is off.

You can have the equivalent of FOR and DO command loops in a batch file, and unconditional branches about the file in the form of GOTO's. There's also IF, for deciding if you actually want to do part of a file based on other parameters, and, finally, PAUSE, which will stop the batch file and prompt you for a key.

The Long List

The COPY command, as we've seen, is used for copying files as it has been since time immemorial. It now supports subdirectory path names. However, it has a few tricks hidden away in it as well. In some respects, it acts a bit like the CP/M PIP transient.

The handiest feature of COPY under DOS is that it allows one to use the system's logical devices as files. This is most easily illustrated by COPYing from the console. If you have to create a small text file and don't feel up for booting the word processor, you can

COPY CON: UGLYDOG

This will create the file UGLYDOG. From this point on, anything you type will go into

UGLYDOG. You can enter a few lines of text for a simple batch file with no waiting on WordStar. When you're done, hit a control Z and return. The file will be written to the disk and, thereafter, behave as any normal text file.

The MODE command controls the screen display. It's especially useful if you've got a partially funky video card or your monitor used to be a TV set from K Mart. It allows one to switch the screen from forty to eighty columns, to switch screen modes and to swing the whole display right or left a bit. If you need it repeatedly it can be placed in an AUTOEXEC file along with the appropriate parameters so it executes every time you boot the system.

MODE wants three parameters. The first is the number of columns you fancy. Any number will do, provided its either forty or eighty. This can be preceded by either BW, for black and white, or CO, for colour. As yet another option, you can replace the number with MONO, for the monochrome display adapter, festering relic that it may be.

The second parameter is either R or L, for right and left. Finally, if you include T as the third parameter you'll be given a test pattern to help you figure out if you're seeing the whole image area.

A typical invocation of MODE would be

The MODE command controls the screen display. It's especially useful if you've got a partially funky video card or your monitor used to be a TV set from K MART.

MODE 40, R, T

which is telling it to set up for a forty column screen, shift it right and display the test pattern. Any of the parameters which you don't feel like dealing with can be left out.

The newest MS-DOS also comes with a printing spooler, notably called PRINT. PRINT will accept up to ten text file names in its print queue, which it will proceed to send out to the printer. Having invoked PRINT you can go on to bigger things... it will sputter away unattended behind your other applications.

The RECOVER utility will ungorch a file which has been zapped by a disk error. Naturally, it can't pull data out of a bad sector, but it will lock out the uncool bits and allow you to access everything else. This is only of use on text files, and RECOVER tends to add some garbage to the files it pulls from their watery graves. They'll want editing.

The aforementioned TREE command allows you to see what's happening in all the subdirectories of a disk without actually threading your way down each path. If you type TREE each of the directories and its subdirectories will be examined and bared to the world. Appending /F to it will show you the files in the directories too.

Quit and Terminate

The flexibility of version two MS-DOS is something which you can really only get your head around it you've used it for a while. It's equally suitable for a programmer's environment, a custom system for untrained operators, a turnkey application and a general place to keep files. Its huge variety of utilities make it extremely easy to work in... you can tool around in even a large, hard disk based system with gallons of files and not get lost.

While MS-DOS is not the sort of super user friendly space of the Macintosh, it's an order of magnitude more functional. If it seems to gripe at you from time to time, try to experience one of the UNIX environments for the PC, the seed from which a lot of it has sprouted. DOS is a pretty good balance between these two extremes.

As IBM has announced a DOS 3.0, primarily in conjunction with its PC AT, there will be those who will fear that even all this splendor may tarnish with the pallor or antiquated bytes. Yes, well, this may be true. I'm not sure I want to see yet another new DOS just yet, though. I mean, one wonders what other commands are likely to be included.

Perhaps something a bit more corporate will turn up. I was thinking of FRUIT. If you type

FRUIT /E

all the Apples in a twelve block area will explode. **CN!**

The Electric Disk Troll

Disks are pretty scary things... much more so than simple disk files or other higher level things. The CP/M operating system, however, offers a number of ways to manipulate disks at the lowest level. Here's a program which makes use of some of these mystic secrets.

by Steve Rimmer

Down in the dark, damp places beneath the oldest, most gnarled trees they dwell, speaking in muttered whispers amongst themselves, plotting, scheming... They have been the stuff of myth and folklore since the dawn of time. As far back as there have been human beings to suspect their presence, patches of dark in the deepest gloom, they have lurked just beyond the corner of one's eye. They are, of course, disk trolls.

Disk trolls are these little weird dudes that come in the night and fool around with your disks so that they crash when you boot 'em. They run the copy protection routines... often so well that you can't even use legitimate copies of software. They also cause your disks to pucker at the seams, collect staples in their plastic fluff and appear unbearably attractive to cats, dogs, gazelles and other family pets.

These disk trolls are, in short, freaked out over mylar... they always have been. However, as it turns out, there is this all purpose disk troll spell which can be used to harness their amazing energy and allow its use for more constructive evil. It's presented here.

In this feature we'll be looking at the utilization of disk troll magic to produce a powerful CP/M disk sector editor. While not so flexible as the popular DU series of programs, it's much more convenient to use and, more to the point, the source code is of a manageable hugeness.

Another Mac and Fries

The Electric Disk Troll program is what is properly known as a sector editor. When you save a file to the disk of your system you save it as a block of text but the disk operating system converts it to a series of sectors. A sector is a portion of one circular track on the disk's surface.

There is no immediately obvious way to correlate a file with where its sectors wind up on the disk. It does, of course, make sense to the operating system. However, it is very often the case that one wants to edit the contents of a disk not at the file level... which could be handled by WordStar or the like... but, rather, sector by sector on the disk itself.

There are several advantages to this... the most notable being that, at least for small patches, this approach is often faster than dealing with the data as a file. This assumes, of course, that you can figure out where on the disk in question the information you want to mess with resides.

The other application for sector editing, and one which can't

be handled as a file... at least, not easily... is in editing the system tracks of a disk. This includes the BIOS, the BDOS and the directory, which live in the first few tracks. These can't ordinary be taken from the disk as files, and, as such, are most easily worked with one sector at a time. Furthermore, these things tend to behave much more predictably in the ways in which they land on the disk surface. As such, finding things in the system tracks of a disk is usually pretty easy.

The large disk editors, like DU... we've offered several as almost free software... allow you to manipulate data at the disk level with amazing flexibility. However, they are, in many cases, tedious to use and quite complicated. For this reason, there has come to exist the Electric Disk Troll.

The Disk Troll is a specialized editor to make doing things to the strings imbedded in disk sectors extremely easy. This is actually a neat place to start in meddling with disk data... you can do things like change the BDOS error messages. Most of the CP/M around here says things like FOULUP ON B: and YOU TURKEY! instead of the usual cryptic utterances.

The Troll is, to begin with, screen oriented. It has a cursor you can move around. It does a heavy slick display and is pretty user friendly. It's also greatly expandable, should you want to make something more of it.

While the source code for the Troll, shown in figure one, is fairly short, observant heads will note that it contains, amidst the traditional 8080 op codes, unusual keywords. This is, in fact, another program for the MAC CP/M macro assembler.

In order to assemble this you will need MAC and the current BIGMAC.LIB, begun in the July 1984 edition of Computing Now! and added to in August. It will want adding to again... the new code is in listing two.

```
;       .....................................................
;       .                                                   .
;       .      Three Eyed Electric Disk Troll Version 1.0   .
;       .          Copyright 1984 (c) Steve Rimmer          .
;       .        Dices, slices, grinds, powders and         .
;       .          places satellites in low orbits          .
;       .                                                   .
;       .....................................................

        MACLIB  BIGMAC          ;INHALE MACRO LIBRARY
        DEFINES                 ;SET UP COMMON DEFINES

ASCLN   EQU     5               ;HOME OF ASCII DISPLAY
ASCPOS  EQU     10              ;WHERE ASCII DISPLAY STARTS
HEXLN   EQU     8               ;HOME OF HEX DISPLAY
HEXPS   EQU     16              ;WHERE HEX DISPLAY STARTS
HEXLEN  EQU     16              ;NUMBER OF HEX DIGITS / LINE
MENULN  EQU     16              ;HOME OF MENU
MENUPOS EQU     3               ;WHERE MENU STARTS
COMLN   EQU     20              ;HOME OF COMMANDS
COMPOS  EQU     23              ;WHERE COMMANDS START
STATLN  EQU     2               ;HOME OF STATUS LINE
RTKEY   EQU     'D'-40H         ;KEY TO MOVE CURSOR RIGHT
LFKEY   EQU     'S'-40H         ;KEY TO MOVE CURSOR LEFT
TRKMAX  EQU     76              ;NUMBER OF TRACKS ON A DISK
SECMAX  EQU     26              ;NUMBER OF SECTORS ON A DISK
        ORG     0100H           ;COLLECT $200
        INTRO                   ;FUDGE STACK
        VECTOR                  ;CREATE LOCAL BIOS TABLE

        CLRSCRN                 ;CLEAR TUBE
        BOX     1,1,SCRW,SCRD-1 ;PRINT A FRAME
        GOTOXY  COMPOS,10       ;MOVE CURSOR
        PRINT   'Electric Disk Troll Version 1.0'
        GOTOXY  COMPOS,11
        PRINT   'Copyright  1984   Steve  Rimmer'

        GOTOXY  COMPOS,COMLN
        PRINT   'Stab  a key  to start the world'
        CONIN                   ;GET THY KEY, TO WIT
        EMPTY   1,1,SCRW,SCRD-1 ;EMPTY THE FRAME

MENU    GOTOXY  MENUPOS,MENULN  ;SHOW DE MENU, MAX
        PRINT   'N Next sector      P Previous sector  '
        PRINT   'I In one track     O Out one track'
        GOTOXY  MENUPOS,MENULN+1
        PRINT   'E Edit             Q Quit             '
        PRINT   'S Select T and S   D Drive'
        GOTOXY  MENUPOS,MENULN+2
        PRINT   <'W Write            ^',RTKEY+40H,' Edit Right      '>
        PRINT   <'^',LFKEY+40H,' Edit Left       C/R Edit Quit'>
        JMP     DRVSEL          ;GO GET THE LOGGED IN DRIVE

GETIT   GOTOXY  COMPOS,COMLN    ;GET SPECIFIED SECTOR
        PRINT   <'Track to start with:      ',BS,BS,BS,BS,BS>
        GETLIN  BUFFER,5        ;GET THE ANSWER
        SWITCH  0,NEXTRD        ;IF RETURN, RETURN
        DECIN   BUFFER+2        ;CONVERT TO BINARY
        SHLD    TRCK            ;SAVE IT
        MOV A,L ! CPI TRKMAX ! JP GETIT         ;BAD CHOICE?
GETIT1  GOTOXY  COMPOS,COMLN+1
        PRINT   <'Sector to start with:      ',BS,BS,BS,BS,BS>
        GETLIN  BUFFER,5        ;GET THE ANSWER
        SWITCH  0,NEXTRD        ;IF RETURN, QUIT
        DECIN   BUFFER+2        ;CONVERT IT
        SHLD    SECT            ;STASH IT, MANFRED
        MOV A,L ! CPI SECMAX ! JP GETIT1        ;LOUSY CHOICE?
        CPI 1 ! JM GETIT1

GETSEC  EMPTY   1,STATLN-1,SCRW,STATLN+3        ;CLEAN UP
        GOTOXY  10,STATLN               ;PLACE CURSOR
        PRINT   'Track '                ;SHOW THE CURRENT
        DECOUT  TRCK                    ;STATUS
        GOTOXY  20,STATLN               ;FOR THE TRACK AND
        PRINT   'Sector '               ;SECTOR
        DECOUT  SECT
        SETDMA  DMA                     ;SET UP DMA BUFFER

        LHLD TRCK ! MOV B,H ! MOV C,L ! CALL TRACK
        LHLD SECT ! MOV B,H ! MOV C,L ! CALL SCTOR
        CALL READ                       ;READ THE SECTOR IN
        SWITCH  1,ERROR                 ;HANDLE READ ERROR

        GOTOXY 10,ASCLN                 ;POSITION CURSOR
        MVI B,80H ! LXI H,DMA-1         ;POINT TO DMA BUFFER

LOOP1   INX H ! MOV A,M         ;GET A CHARACTER
        CPI ' ' ! JM BADCHR     ;LESS THAN SPACE?
        CPI 'z' ! JP BADCHR     ;MORE THAN z?
SEECHR  TYPE                    ;SHOW THE CHARACTER
        MOV A,B                 ;
        SWITCH  41H,NEWLINE     ;SEE IF NEW LINE NEEDED
        LOOP    LOOP1           ;OTHERWISE LOOP

        MVI H,HEXLN ! MVI L,HEXPS ! LXI D,DMA ! MVI B,8
HEXMN   GOTOXY                  ;POSITION FOR HEX DISPLAY
        PUSH B ! MVI B,HEXLEN
HEXLP   LDAX    D               ;GET BYTE (HL IS BUSY)
        SAVER                   ;SAVE REGS
        HEXBYTE                 ;SHOW THE BYTE IN HEX
        MVI     A,' '           ;PRINT A SPACE
        TYPE
        RESTR                   ;GETEN ZE REGS BACKENZ
        INX D ! INR L ! INR L ! INR L   ;BUMP COUNTERS
        LOOP    HEXLP           ;LOOP
        MVI L,HEXPS ! INR H ! POP B
        LOOP    HEXMN           ;OUTER LOOP
        JMP     DRVSEL          ;SHOW DRIVE AGAIN

BADCHR  MVI     A,'.'           ;NON-ASCII CHARACTERS
        JMP     SEECHR          ;BECOME DOTS

NEWLINE GOTOXY ASCPOS,ASCLN+1   ;START NEW LINE
        DCR B ! JMP LOOP1       ; ...AND CONTINUE

ERROR   EMPTY   1,STATLN-1,SCRW,STATLN+1        ;BLANK STATUS LINE
        GOTOXY  10,STATLN       ;POSITION CURSOR
        PRINT   'Tilt... '      ;SAY IT

NEXTRD  GOTOXY  COMPOS,COMLN-1  ;GET THE NEXT COMMAND
        PRINT   <'Command:  ',BS>
        CONIN                   ;WAIT FOR IT
        SWITCH  'N',NSECT       ;...NEXT SECTOR
        SWITCH  'P',LSECT       ;...PREVIOUS SECTOR
        SWITCH  'I',ITRCK       ;...IN ONE TRACK
        SWITCH  'O',OTRCK       ;...OUT ONE TRACK
        SWITCH  'E',EDIT        ;...GO TO EDIT MODE
        SWITCH  'Q',QUIT        ;...QUIT TROLL
        SWITCH  'S',GETIT       ;...SELECT NEW SECTOR
        SWITCH  'D',LOGDRV      ;...LOG IN NEW DRIVE
```

```
        SWITCH  'W',PUTIT       ;...WRITE SECTOR TO DISK
        JMP     NEXTRD          ;LOOP ON BAD OPTION

LOGDRV  GOTOXY  COMPOS,COMLN+2          ;ASK FOR DRIVE
        PRINT   <'Drive:  ',BS>         ;SPEC
        CONIN                           ;GETIT
        SBI 'A' ! CPI 15 ! JP NEXTRD    ;SET DRIVE WITH
        MVI C,14 ! MOV E,A ! CALL BDOS  ;BDOS CALL
DRVSEL  GOTOXY  50,STATLN               ;SET UP FOR STATUS LINE
        PRINT   'Drive: '               ;SAY WHAT'S UP, DOC
        MVI C,25 ! CALL BDOS ! ADI 'A'  ;GET DRIVE
        TYPE                            ;SHOW IT
        JMP     NEXTRD                  ;RETURN TO COMMAND LINE

PUTIT   LHLD TRCK ! MOV B,H ! MOV C,L ! CALL TRACK
        LHLD SECT ! MOV B,H ! MOV C,L ! CALL SCTOR
        CALL WRITE                      ;WRITE SECTOR TO DISK
        SWITCH  1,ERROR                 ;HANDLE WRITE ERROR
        JMP     NEXTRD                  ;NEXT OPTION

NSECT   LHLD SECT ! INX H ! SHLD SECT   ;INCREMENT SECTOR COUNT
        MOV A,L ! CPI SECMAX+1 ! JM GETSEC
        LXI H,1 ! SHLD SECT ! JMP OTRCK

LSECT   LHLD SECT ! DCX H ! SHLD SECT   ;DECREMENT SECTOR COUNT
        MOV A,L ! CPI 1 ! JP GETSEC
        LXI H,SECMAX ! SHLD SECT ! JMP ITRCK

ITRCK   LHLD TRCK ! DCX H ! SHLD TRCK   ;DECREMENT TRACK COUNT
        MOV A,L ! CPI 0 ! JP GETSEC
        LXI H,0 ! SHLD TRCK ! JMP GETSEC

OTRCK   LHLD TRCK ! INX H ! SHLD TRCK   ;INCREMENT TRACK COUNT
        MOV A,L ! CPI TRKMAX+1 ! JM GETSEC
        LXI H,TRKMAX ! SHLD TRCK ! JMP GETSEC
EDIT    MVI H,ASCLN ! MVI L,ASCPOS ! SHLD CURPOS
        MVI H,HEXLN ! MVI L,HEXPS ! SHLD HEXPOS
        LXI H,DMA ! SHLD PNTPOS
        GOTOXY  32,STATLN
        PRINT   'Character: '

EDLOOP  GOTOXY  43,STATLN               ;POSITION CURSOR
        PRINT   <'   ',BS,BS,BS>        ;... TO SHOW THE
        LHLD PNTPOS ! LXI D,-127 ! DAD D
        DECOUT                          ;POINTER
        LHLD    HEXPOS                  ;GET HEX CURSOR
        GOTOXY                          ;SET UP TO PRINT
        PRINT <BS,'[',CRT,CRT,']'>      ;SHOW THE CURSOR
        LHLD    CURPOS                  ;GET ASCII CURSOR
        GOTOXY                          ;SET UP TO FLASH
        CONIN                           ;WAIT FOR LIFE
        PUSH PSW ! LHLD HEXPOS          ;GET HEX POSITION
        GOTOXY                          ;LOCATE ZE DOT
        POP PSW ! PUSH PSW              ;GET CHR BACK
        CPI ' ' ! JM EDLOOP1            ;BYPASS CONTROLS
        HEXBYTE                         ;SHOW CHARACTER
        POP PSW ! PUSH PSW ! LHLD PNTPOS ! MOV M,A

EDLOOP1 LHLD    HEXPOS                  ;GET POSITION AGAIN...
        GOTOXY                          ;...KILL THE HEX
        PRINT   <BS,' ',CRT,CRT,' '>    ;...CURSOR
        POP     PSW                     ;GET CHARACTER
        SWITCH  CR,NEXTRD               ;IF CR, BE GONE
        SWITCH  RTKEY,MOVRT             ;OR MOVE RIGHT
        SWITCH  LFKEY,MOVLF             ;OR MOVE LEFT
        CPI ' ' ! JM EDLOOP             ;IGNORE OTHER CTRLS

MOVRT   LHLD HEXPOS ! MOV A,L ! CPI HEXPS+43 ! JM INHHEX
        MVI L,HEXPS ! MOV A,H ! CPI HEXLN+7 ! JM INVHEX
        MVI L,HEXPS+45 ! MVI H,HEXLN+7 ! JMP STRHEX
INHHEX  INR L ! INR L ! INR L ! JMP STRHEX
INVHEX  INR     H
STRHEX  SHLD    HEXPOS

RCUR    LHLD CURPOS ! MOV A,L ! CPI ASCPOS+63 ! JNZ INCUR
        MOV A,H ! CPI ASCLN ! JNZ EDLOOP
        MVI H,ASCLN+1 ! MVI L,ASCPOS ! SHLD CURPOS ! JMP INCPOS
INCUR   INR L ! SHLD CURPOS
INCPOS  LHLD PNTPOS ! INX H ! SHLD PNTPOS !JMP EDLOOP

MOVLF   LHLD HEXPOS ! MOV A,L ! CPI HEXPS+3 ! JP DEHHEX
        MVI L,HEXPS+45 ! MOV A,H ! CPI HEXLN+1 ! JP DEVHEX
        MVI L,HEXPS ! MVI H,HEXLN ! JMP STLHEX
DEHHEX  DCR L ! DCR L ! DCR L ! JMP STLHEX
DEVHEX  DCR     H
STLHEX  SHLD    HEXPOS

LCUR    LHLD CURPOS ! MOV A,L ! CPI ASCPOS ! JNZ DECUR
        MOV A,H ! CPI ASCLN+1 ! JNZ EDLOOP
        MVI H,ASCLN ! MVI L,ASCPOS+63 ! SHLD CURPOS ! JMP DECPOS
DECUR   DCR L ! SHLD CURPOS
DECPOS  LHLD PNTPOS! DCX H ! SHLD PNTPOS ! JMP EDLOOP

QUIT    CLRSCRN                 ;CLEAR SCREEN AND
        EXTRO   60              ;GO HOME

;       BUFFERS, POLISHERS AND HIGH GLOSS WAX

TRCK    DS      2               ;HOME OF TRACK NUMBER
SECT    DS      2               ;HOME OF SECTOR NUMBER
CURPOS  DS      2               ;CURSOR POSITION
HEXPOS  DS      2               ;HEX CURSOR POSITION
PNTPOS  DS      2               ;POINTER INTO DMA BUFFER
BUFFER  DS      1               ;GENERAL CONVERSION BUFFER
        END
```

The Small Screen

There are two interesting things happening in the workings of the Disk Troll. The first, and perhaps the more enlightening of the two, is the use of a number of new macros which handle screen addressing.

In most CP/M based utilities the screen is treated like a teletype... that is, stuff just scrolls around on the tube. However, this is not how it has to be, and more complex utilities will generally allow you to use the whole screen. Word processors are a good example of this.

In some systems, such as the IBM PC, there are system calls which will position the cursor anywhere you fancy seeing it. The CP/M BIOS does not provide for this and, while most computers have some provision for this sort of thing, it's anything but standard.

There is one fairly common approach to moving the flashing box, this being the one which we've used here. Character thirty is usually interpreted by most tubes as being the home cursor command. Character ten, a line feed, generally moves it down and character twelve moves it right. This being the case it's possible to position the cursor anywhere on the screen by printing a home character followed by a string of line feeds and a string of cursor right characters.

This is crude, and relatively slow when compared with those terminals that have direct cursor addressing, but it is quasi-universal to most machines.

The cursor movement routines for this program live in macros in BIGMAC.LIB. The primary one is GOTOXY, which takes two parameters as cartesian co-ordinates. Now, this provides one with a fair bit of flexibility. If you are using a system which has some manner of slick cursor positioning, through escape sequences or whatever, you will be able to replace the GOTOXY code with a simple PRINT macro call. Otherwise, you can leave things as they are. Even on the relatively slow screen of an Apple this arrangement isn't too tedious.

Having screen addressing which allows for the relatively efficient positioning of the cursor makes doing the Disk Troll as a full screen editor fairly practical. In fact, it's unusually powerful because of this.

Under The Old Tree

The heart of the disk troll is in yet another macro, called VECTOR. This thing is not a proper macro, in that it can only be called once in a program. However, it's convenient to leave it in the macro library, as it has various uses.

As we've noted in other articles concerning the hacking of CP/M... see *BIOS Chemistry* in the October 1983 edition of Computing Now!... the operating system maintains a table of

```
;ADD TO DEFINES MACRO
CRT     EQU     'L'-40H
HME     EQU     30
BX      EQU     160
SCRW    EQU     80      ;SCREEN WIDTH
SCRD    EQU     24      ;SCREEN DEPTH
;
PRINT   MACRO   STRING
;REPLACE EXISTING PRINT MACRO
        SAVER
        LOCAL   ENDPR, MSSG
        MVI C,9 ! LXI D,MSSG ! CALL 5
        JMP ENDPR
        IF NUL STRING
MSSG    DB      13,10
        ENDIF
        IF NOT NUL STRING
MSSG    DB      STRING
        ENDIF
        DB      '$'
ENDPR   RESTR
        ENDM
;
EMPTY   MACRO   XS, YS, XE, YE
;CLEAR A FRAME
        SQUARE  ' ',XS+1,YS+1,XE-1,YE-1
        ENDM
;
SQUARE  MACRO   CHR, XS, YS, XE, YE
;PRINT SOLID SQUARE OF CHR ON TUBE
        LOCAL   SQUA1, SQUA2
        SAVER
        MVI B,(YE-YS)-1
SQUA2   SAVER
        MVI A,YS ! ADD B ! DCR A
        MOV H,A ! MVI L,XS
        GOTOXY
        MVI B,(XE-XS)-3
SQUA1   MVI A,CHR
        TYPE
        LOOP SQUA1
        RESTR
        LOOP SQUA2
        RESTR
        ENDM
;
GOTOXY  MACRO   XARG,YARG
;POSITIONS THE CURSOR AT XARG, YARG OR L,H
        LOCAL   XLOOP, YLOOP
        SAVER
        PRINT   HME
        IF NUL YARG
```

```
        RESTR
        SAVER
        MOV     B,H
        ENDIF
        IF NOT NUL YARG
        MVI     B,YARG
        ENDIF
YLOOP   PRINT   LF
        LOOP    YLOOP
        IF NUL XARG
        RESTR
        SAVER
        MOV     B,L
        ENDIF
        IF NOT NUL XARG
        MVI     B,XARG
        ENDIF
XLOOP   PRINT   CRT
        LOOP    XLOOP
        RESTR
        ENDM
;
BOX     MACRO   XS, YS, XE, YE
;PRINT A BOX ON THE SCREEN
        LOCAL   BOX1, BOX2, BOX3, BOX4
        SAVER
        GOTOXY XS,YS
        MVI     B,(XE-XS)-1
BOX1    MVI     A,BX
        TYPE
        LOOP    BOX1
        MVI     B,(YE-YS)-1
BOX2    SAVER
        MVI L,XS ! MVI A,YS ! ADD B ! MOV H,A
        GOTOXY
        MVI     A,BX
        TYPE
        MVI     B,(XE-XS)-3
BOX3    MVI     A,CRT
        TYPE
        LOOP    BOX3
        MVI     A,BX
        TYPE
        RESTR
        LOOP    BOX2
        GOTOXY  XS,YE
        MVI     B,(XE-XS)-1
BOX4    MVI     A,BX
        TYPE
        LOOP    BOX4
        RESTR
        ENDM
;
DECIN   MACRO   ADDR
;ACCEPTS DECIMAL VALUE, RETURN BINARY
        LOCAL   DLOOP,OVERSUB
        JMP     OVERSUB
XDECIN  LXI D,0 ! XCHG
DLOOP:  LDAX D ! SUI '0' ! ANA A ! RM
        CPI 10 ! CMC ! RC
        INX D ! DAD H ! PUSH H
        DAD H ! DAD H ! POP B ! DAD B
        MOV C,A ! MVI B,0 ! DAD B
        JMP     DLOOP
OVERSUB:
DECIN   MACRO   ?ADDR
        IF      NOT NUL ?ADDR
        LXI     H,?ADDR
        ENDIF
        CALL    XDECIN
        MOV     A,L
        ENDM
        DECIN   ADDR
        ENDM
;
VECTOR  MACRO   ADDR
;COPIES BIOS VECTORS TO ADDR OR TABLE
;RETURN WITH H POINTING TO LOCAL TABLE
        LOCAL   VLOOP,ENDIT
        LHLD    0001
        IF NUL ADDR
        LXI     D,WBOOT
        ENDIF
        IF NOT NUL ADDR
        LXI     D,ADDR
        ENDIF
        MVI     B,48
VLOOP   MOV A,M ! INX H ! STAX D ! INX D
        DCR B ! JNZ VLOOP
        IF NUL ADDR
        LXI H,WBOOT ! JMP ENDIT
WBOOT   DS      3
CNST    DS      3
CNIN    DS      3
CNOUT   DS      3
LIST    DS      3
PUN     DS      3
RDR     DS      3
HOME    DS      3
SELECT  DS      3
TRACK   DS      3
SCTOR   DS      3
STDMA   DS      3
READ    DS      3
WRITE   DS      3
LSTSTAT DS      3
SECTRN  DS      3
        ENDIF
ENDIT   ENDM
;
LOOP    MACRO   ADDR
;DECREMENTS B AND LOOPS TO ADDRESS
        DCR B ! JNZ ADDR
        ENDM
```

jumps, or *vectors* into its hardware interface code, the BIOS. This allows the CCP to access the lowest level I/O of the system, translating things like disk access commands into sequences of track and sector reads and writes.

The BIOS jump table consists of sixteen vectors... you can find them in the VECTOR macro. Since the table can be located programmatically and, thereafter, used by software other than the CCP it's possible for lowly mortals such as ourselves to manipulate the system at this level too.

There are a number of ways to get this together, but the simplest is to copy the BIOS table into bit of local RAM with some labels attached to it, so as to be able to call the jump vectors like

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subroutines. This, not surprisingly, is the existential purpose of VECTOR.

Looking at the code for the Disk Troll it will be noted that, in fact, the VECTOR macro is essentially the first thing that happens. Note that the labels for the vectors created by VECTOR are global, so they can be called by the rest of the program even though it exists outside the macro. MAC provides for this by having one simply forget to declare them as local.

If you think of a disk as a series of concentric rings... the tracks... with each ring divided up into bits... the sectors... the whole works starts looking like a polar grid co-ordinate affair. As such, moving around the disk is fairly easy... you'll need commands for going in and out in one track increments and two more for moving along the track sector by sector.

In fact, the editor also provides for selecting a track and sector combination numerically.

The BIOS allows for both these things with relatively little fanfare. There are four calls involved, which I've named TRACK, SCTOR, READ and WRITE. In the case of the former two, one simply loads the number of the desired track and sector into the C register and slings the call. The others are still more straight up... the one sector moves through the DMA buffer each time you yell for one.

Editing a sector entails its being selected and read into the DMA buffer. This can be anywhere... you get to set it... but 80H to 100H is traditional, and as this space is provided by CP/M it seems rude to ignore it. The contents of the DMA buffer can thence be displayed.

There are lots of ways of presenting a string of bytes. This program uses two. Selecting the sector of your dreams will cause it to be displayed at the top of the screen in ASCII and in the middle as a hexadecimal representation. Each ASCII character has a corresponding hex digit.

Now, not all the characters which can be represented by bytes display well. Some would make quite a mess of the screen and, as such, it's desirable to filter out the unprintable codes. This is handled by the filter at LOOP1 and the bit at BADCHR.

Having seen what a sector looks like, it can be edited, using the E command. This will position the terminal cursor over the first character of the ASCII display and a second cursor... a pair of square brackets... around the first hex digit. Moving the ASCII cursor will move the hex cursor, so it's possible to read the hex value of the byte under the cursor at any time.

The codes for moving the cursor are in keeping with those used by WordStar... control D goes right and control S goes left. You can change these if you feel like it... they're stashed in equates at the top of the source file. A carriage return slips gently out of the edit mode... any printable characters you hit will show up in the sector display, overwriting whatever the cursor is over at the time.

Once a sector has been edited it must be replaced on the disk from whence it came. To get this together you'd hit RETURN to get out of the edit mode and W to write the sector. Now, some BIOS's do not perform a write when told to do so but, rather, set a flag to indicate that upon the next disk access a write is supposed to happen before anything else comes down. As such, you may find that you have to hit the sequence W I O, which sets the write flag and then steps the disk head in and out once, causing the sector data to actually be written to the disk.

This should result in the screen's displaying the sector as you've edited it.

There are a few other things you may want to check out regarding this code. To begin with, the number of tracks and sectors on a disk... as far as the program is concerned... is given in equates at the top of the file. If these are set correctly they will allow you to step through the sectors and wrap around to the next track if you try to step into something non-existent. If you make the SECMAX equate too large you will generate a BIOS error.

This is actually not as serious as it sounds... most intelligently designed BIOS's don't consider a bad read to be a fatal error, and will return to the offending caller with an error flag set. The program will interpret this as a good excuse to print TILT!!! at the top of the screen, something it doesn't get much of a chance to do otherwise. For the most part, BIOS errors are simply inconvenient when encountered by the Troll.

Secondly, if you wish to enhance this code and make it do more stuff... there's lots of opportunity to hack with the Troll... you'll probably want to move the stuff around on the screen. As there's a lot of screen oriented activity happening this could get a bit weird, as the cursors may not show up where they're supposed to.

To this end, all the location parameters for the various elements of the display are situated in the rolling fields of the initial equates. If you change these everything else will assemble relative to them and, as such, keep on working.

Fun In The Low Sectors

There are a lot of things that want Trolling in CP/M. In testing things like this I confess that I usually attack the cold boot message first. Steel grey corporate non-sentences like

CP/M2 on TRS-80 Model II
64K Version 2.25-C
Copyright (c) 1980, Lifeboat Associates

translate so nicely into

Help! I am an inch high
and I am being
held against my will in disk drive A:

or

LS/D 25 on Ugly Grey Box
Made in Bohemia
Copyright 1903 (c), Mother Martha & Son

There are also the aforementioned error messages, the prompts and, when you get tired of these there are the literals in programs... you can usually find these with a bit of looking. Keep in mind that, once Trolled, a program or an operating system image will copy true to your mutations.

Most of the disks around here have been Trolled to an almost unrecognizable degree. The messages they produce are... well, "colourful" is a polite description. New employees often find them confusing. You'll notice them out in the parking lot flagging down UFO's from time to time, having been told to do so by what should have been a DISK FULL message.

There are serious ethical problems in a program like this. If it should fall into the wrong hands... computers could start communicating in English... ack! **CN!**

This program is included in the Wunderdisk collection of CP/M Software. See page 79.

Apple WordStar Lightning

There have been a number of patches which dealt with the the profound lack of speed encountered by users of WordStar on Apple compatible systems. Most of them work by patching the WAIT flag to read GO TO LUNCH. This one's a bit different... it makes the whole works happen in the blink of an eye.

by Anthony DeBoer

Word processors are wonderful things. Words magically appear before your eyes, forming into phrases, sentences, paragraphs, and whole masterpieces, all at the tap of a few fingers... or of all ten, if you know how to type. What would once have taken years to write with a feather and a pot of ink or months with the trusty old Underwood can now be done in the course of a lazy afternoon with one's electronic scribe.

This is true of almost any word processor... ahem, except, in many cases, of WordStar, one of the most powerful packages, running on an Apple compatible system, one of the most common computers. Apple clones don't like WordStar, and the feeling is mutual. The Apple CP/M BIOS, when coupled with the unusual machinations required to drive the system's hardware, is tediously slow.

In this article we'll look at one of most interesting... if highly experimental... approaches to making WordStar run at the red line on a fruit. In fact, the speeds attainable with this approach far exceed anything that can be done through a normal CP/M BIOS. WordStar will be able to update its screen virtually instantaneously.

However, be warned. This thing is not for the faint of heart. More to the point, you'll also want have had a lot of experience patching code to get it working.

This patch will function with most Apple compatible systems using the Videx eighty column card.

Patchwork Solution

The patches described herein can best be described as strange. They're based on the fact that WordStar keeps a copy of what it wants to have on the screen for its own reference. The routines here copy this into the Videx card's screen memory as required. This is a massively faster way of updating the Videx's data than "printing" the information through the official channels.

In order to keep screen flicker to a minimum, the screen is divided into eight two hundred and fifty-six byte blocks, or pages, and only the pages that need to be copied get copied.

The assembler code for these patches probably looks even more like Greek than assembler code usually does. This is partly because some of the code is stashed into small free areas in WordStar, and partly because some Z-80 instructions are used, which the normal ASM assembler doesn't support unless you cheat on it a bit.

Users of Unitron clones with the funny keyboards that generate weird symbols in the place of the capital letters K through P when the caps lock is off should note that this will be a problem with these patches. Since CP/M's normal character translation table is bypassed and there is no room for a new table, these symbols will appear.

The only workable fix for Unitrons is to blow a new character EPROM.

Another problem that can occur, especially with cheaper varieties of eighty column cards, is screen flicker. Since this code puts two hundred and fifty six character blocks of text on the screen instead of individual letters, more flicker will occur. This

may or may not bother you, being a matter of individual taste. It is, of course, no problem if you touch type with your eyes closed.

One final catch is that when you use the opening menu's R command to run a program, the screen will look like a dog's breakfast. This is because of some disagreements between CP/M's BIOS and the WordStar patches concerning the settings of the Videx card. It isn't harmful, shocking though it may seem the first time it happens.

The wait factor in the CONOUT routine can be adjusted to personal preference. This is how long a delay will occur after WordStar outputs text before it gets updated to the screen. If it's too small, the screen will get updated in fragments, while if it is too big, messages like NEW FILE and the changes in global search and replace that appear momentarily on the screen will be lost. Values in the range of about sixteen to twenty-four, after a bit of experimentation, seem about right.

Making it Work

These patches work as an overlay to an existing copy of WordStar 3.0. Different revisions use different addresses for the stuff that needs to be patched, so these patches as presented won't work on other versions. Once you have the file on your system in one piece, feed it to the ASM assembler that you got with CP/M and then patch it over a copy of WordStar using the DDT utility, as follows.

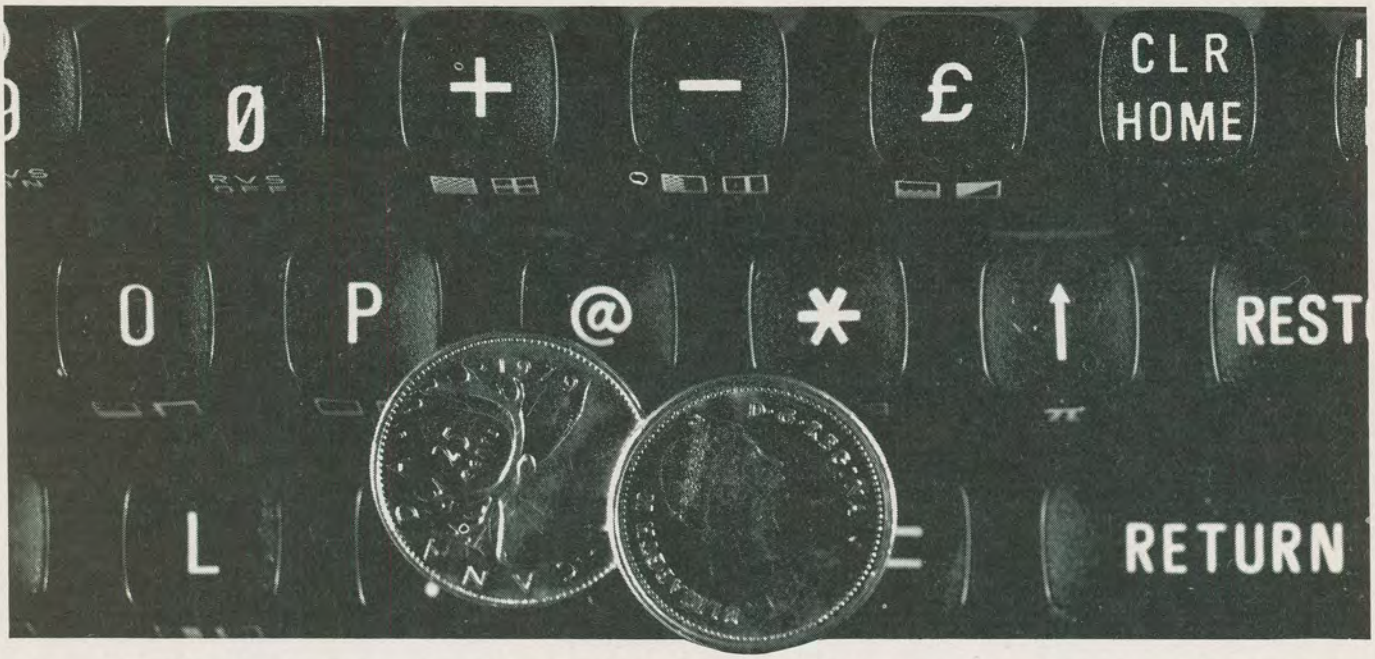
```
ASM WSPAT
CP/M ASSEMBLER VER 2.0
035C
002H USE FACTOR
END OF ASSEMBLY

DDT WS.COM
DDT VERS 2.2
NEXT  PC
4000 0100
-IWSPAT.HEX
-R
NEXT  PC
4000 0000
-G0
SAVE 63 XWS.COM
```

Don't delete your original copy of WordStar, at least until the patched version... it'll be XWS.COM here... proves to work and you decide whether you like it. Better still, make sure you do all these patches on a backup file, and keep an unpatched copy of WordStar somewhere, as this thing has been known to crop up with a few latent bugs on some systems after quite a lot of seemingly decent service.

```
; Patches for Wordstar 3.0 running on an
; Apple ][+ with a Videx card in slot #3

; Copyright (c) 1984 Anthony DeBoer

BS      EQU     08H     ;backspace
LF      EQU     0AH     ;linefeed
ESC     EQU     1BH     ;escape
DEL     EQU     7FH     ;delete

IDTEX   ORG     018FH
        DB      ' Apple ][+ w/Videx card
        DB      'in slot 3 ',0FH,0

HITE    ORG     0248H   ;screen height
        DB      24

WID     ORG     0249H   ;and width
        DB      80

CLEAD1  ORG     024AH
        DB      0
UNSTR   DB      ESC,'*',ESC,'=7 ',LF,'$'

CLEAD2  ORG     0253H
        DB      0
CRPOS   XCHG            ;store cursor position
        SHLD    UPDATE+1

CTRAIL  ORG     0258H
        NOP
        RET
FLAG    DB      255
FLAG1   DB      0
        DB      0

UCRPOS  ORG     0264H
        JMP     CRPOS

ERAEOL  ORG     026DH
        DB      1,LF    ;force full update
        DS      5

LINDEL  ORG     0274H
        DB      1,LF    ;full update
        DS      5

LININS  ORG     027BH
        DB      1,LF,0  ;full update
CONOUT  LXI     H,FLAG1
        MVI     M,24    ;wait factor (may be altered
        DCX     H       ;point to FLAG
IVON    ORG     0284H
        NOP
        CPI     LF
        JNZ     NOTLF   ;jump if not linefeed
        NOP
IVOFF   ORG     028BH
        NOP
        MVI     M,0FFH  ;whole screen gets updated
        RET
TRMINI  ORG     0292H
        DB      0
NOTLF   INX     D       ;next is cursor position
        DW      53EDH,UPDATE+1  ;LD (UPDATE+1),DE
        DCX     D
        XRA     A
        STC
TRMUNI  ORG     029BH
        NOP
CONO1   ADC     A       ;get appropriate bit
        DCR     D
        JP      CONO1
        ORA     M       ;add it to FLAG
        MOV     M,A
        RET

INISUB  ORG     02A4H
        NOP
        NOP
        RET

UNISUB  ORG     02A7H
        JMP     UNSET

USELST  ORG     02AAH
        DB      255     ;can use last char on screen

DELCUS  ORG     02AEH
        DB      0

DELMIS  ORG     02AFH
        DB      0

MEMAPV  ORG     02B0H
        DB      0

HIBIV   ORG     02B3H
        DB      0

HIBCUR  ORG     02B4H
        DB      0

UCNSTA  ORG     02BAH
        JMP     CONST

UCONI   ORG     02BDH
        JMP     CONIN

UCONO   ORG     02C0H
        JMP     CONOUT

DEL1    ORG     02CFH
        DB      3,3,19H,7,9

APLFLG  ORG     02D7H
        DB      0

MORPAT  ORG     02E0H
UPDATE  LXI     D,$-$   ;modified by cursor position
        MVI     L,0FH   ;set cursor position
        CALL    SETREGS
        LXI     D,0000  ;set screen origin
        DCR     L
        CALL    SETREGS
        LDA     0EFFFFH ;disable ROMs
        LHLD    0006    ;get addr of virtual screen
        LXI     D,-786H ;offset below BDOS
        DAD     D
        LXI     B,0E0B0H-2      ;set up for copy
        LXI     D,0EC00H
UPLOOP  LDA     0E300H  ;enable videx card
        INR     C
        INR     C
        PUSH    B
        DB      0CBH,89H        ;RES 1,C
        LDAX    B       ;activate screen page
        POP     B
        DB      0CBH,8AH        ;RES 1,D
        ORA     A
        LDA     FLAG    ;see if this page goes
        RAR
        STA     FLAG
        JC      UPYES
        ORA     A
        LDA     0EFFFFH ;disable card if no copy
        RZ              ;return if no more to copy
        INR     D       ;skip this page
        INR     H
        JMP     UPLOOP
UPYES   PUSH    B       ;copy 256 bytes to card
        LXI     B,0100H
        DB      0EDH,0B0H       ;LDIR
        POP     B
        JMP     UPLOOP
SETREGS MOV     H,E     ;set Videx registers
        SHLD    0E0B0H
        DCR     L
        MOV     H,D
        SHLD    0E0B0H
        RET
CONST   LXI     H,FLAG1 ;do screen update?
        DCR     M
        CZ      UPDATE
        LDA     0E000H  ;check keyboard
        RAL
        SBB     A
        RET
CONIN   CALL    UPDATE
        MOV     C,E     ;BC is now E000
CONIN1  LDAX    B
        XRI     80H
        JM      CONIN1  ;wait for a key
        STA     0E010H  ;clear strobe
        CPI     BS      ;left arrow becomes DEL
        RNZ
        MVI     A,DEL
        RET
UNSET   MVI     C,9     ;return screen control to BIOS
        LXI     D,UNSTR ;clear screen and scroll
        JMP     0005H   ;call to BDOS function

PBGMEM  ORG     035CH   ;code must not come past here

        END
```

CNI

Two Bits More for the 64



It's not that hard to enhance the BASIC of the Commodore 64 by adding new things to it. This month we'll look at a pair of new commands for the eight bit plastic doorstop.

adapted from an article

by Tony Cross

The prospect of adding new keywords to the BASIC of the Commodore 64 is one which understandably interests users of this system. The 64, while a powerful system for things like playing video games and building television commercials around, is a bit of a sloth's bedwarmer when approached in a programmer's environment. The BASIC, while not altogether nude, is a bit threadbare.

Each of the keywords in the 64's BASIC is, in most rudimentary sense, simply a collection of small machine language routines. In fact, you would probably be surprised at just how little it takes to implement even a fairly powerful keyword. Part of the thing that makes the 64 such an interesting machine to hack on at this level is the existence of a really huge set of ROM routines built into the little ankle biter.

It's probably fair to say that the 64's BASIC contains all of the essential words already built in. The sneaky parts are the luxury features that just aren't in attendance. However, it can also be said that these words are not really unique functions unto themselves. They tend, either in use or, at least, in operation, to be ancillary to existing ROM code.

As such, adding new words to the 64 is very often a matter of simply setting up a few parameters, figuring out what needs to be done and then calling the appropriate points in the ROM. You gots ta know where these points be, of course, but this is one of the reasons that magazines like this one exist.

We looked at several programs to add useful functions to the silicon neandertal in the October edition of Computing Now! and, because it still seems like a reasonably good idea, we're going to have a peek at a few more. Actually, a POKE would probably be more appropriate.

Sneakers

The June edition of Computing Now! featured an article called *Rescue Your 64* in which we saw what the inside of a BASIC program looks like on the 64. While you enter normal BASIC into the machine and it is thereupon displayed as what you entered, there is a lot of translation going on between your screen and the 64's memory.

In fact, the text of a BASIC program must be tokenized, or compressed into symbolic notation, and linked, or outfitted with address pointers for each line, prior to its being of much use to the 64. The machine takes care of all of this through yet another clump of the aforementioned ROM routines. Once packed up for shipping, the text will behave in a very specific manner, one which the 64 finds easily predictable. The *Rescue* article got more deeply into this.

When you do things like running and editing a BASIC program, the 64 must be able to check out and optionally manipulate the program it has rumbling around in its belly. There are, in fact, two ROM routines that allow it to handle this. The first, and probably the most useful as far as the writing of utilities and keywords goes, is called FNDLIN. Its entry point lives at $A613. It can scan through a whole burbling quagmire of BASIC and locate the line with a specific line number.

To use FNDLIN one would take the number of the line one wanted to catch up with and reduce it to a sixteen bit word. The high byte goes in location $15, and the low one in $14. Next, one would call FNDLIN. If the carry flag is set high on return from this routine the requested line exists and location $5F will contain a sixteen bit word which is the address of the first byte of the line in memory.

Keep in mind that this will be the first byte of a tokenized line, so, if you PEEK out the ensuing bytes you will get readable

quotated text but, other than that, you'll be able to see quite a number of highly bizarre graphics characters.

Actually, as we saw in *Rescue*, the first two bytes of each line are taken up by the list link. This is the pointer which points down to the start of the *next* line. The two bytes after that are the line number, so the program text starts a total of four bytes after the number returned by FNDLIN.

If you call FNDLIN and ask it to troll for a nonexistent line it will return with the carry flag reset and the address of the next higher existing line in location $5F.

The other useful ROM routine which is involved with all this text stuff is LNKPTR, which starts at $A533. It restructures the linked list that keeps track of where all the program lines begin. It's actually a component part of the program editor, but you can call it any time you go butchering around in your program text and want to re-link it so as not to freak the 64.

Something OLD, Something NEW

The two keywords we're going to look at in this feature both operate on the program text in the machine at the moment. You might have figured that, having just sloughed through several steaming paragraphs of discourse on the subject.

The first word we'll be looking at, the code of which occupies listing one, is OLD. The OLD keyword is strangely absent from almost all implementations of Microsoft BASIC, which is a moderately serious omission in an imperfect universe such as this one. OLD allows you to undo the otherwise permanent effects of an ill thought out NEW.

When you do a NEW the Commodore 64 assumes that you are well and truly displeased with the text that's in your computer and want to eradicate its very memory from all time and space. A NEW command is, as far as it's concerned, irrevocable.

The mechanism of NEW is to reset BASIC's memory pointers so as to indicate that all of its memory space is empty. It also garbages up the first part of the linked list which holds the BASIC program lines.

Listing 1. The OLD keyword.

```
 10 033C          !*********************************
 20 033C          !*                               *
 30 033C          !*          OLD KEYWORD          *
 40 033C          !*                               *
 50 033C          !*    VERSION 1.0 -- 10/02/84    *
 60 033C          !*                               *
 70 033C          !* COPYRIGHT (C)  A.L.CROSS 1984 *
 80 033C          !*                               *
 90 033C          !*********************************
100 033C          !
110 033C          !
120 C5C3          *=$C5C3
130 C5C3          !
140 C5C3          !
150 C5C3          !VARIABLES AND EQUATES
160 C5C3          !
170 C5C3          LNKPTR      =  $A533
180 C5C3          FNDLIN      =  $A613
190 C5C3          PRTSTG      =  $AB1E
200 C5C3          !
210 C5C3 E000     OLD         CPX #$00                ;CHECK STATEMENT FLAG
220 C5C5 F003                 BEQ DOOLD
230 C5C7 4C08AF               JMP $AF08
240 C5CA A901     DOOLD       LDA #$01
250 C5CC A8                   TAY
260 C5CD 912B                 STA ($2B),Y             ;OVERWRITE NULL BYTE
270 C5CF 2033A5               JSR LNKPTR              ;RE-LINK PROGRAM
280 C5D2 A9FF                 LDA #$FF
290 C5D4 8514                 STA $14                 ;SET MAX LINE NUMBER
300 C5D6 8515                 STA $15
310 C5D8 2013A6               JSR FNDLIN              ;FIND LAST LINE ADDRESS
320 C5DB A902                 LDA #$02                ;ADD 2 TO LAST LINE
330 C5DD 18                   CLC                     ;ADDRESS
340 C5DE 655F                 ADC $5F
350 C5E0 852D                 STA $2D                 ;SET NEW END OF PROGRAM
360 C5E2 852F                 STA $2F                 ;AND VARIABLES
370 C5E4 8531                 STA $31
380 C5E6 A900                 LDA #$0
390 C5E8 6560                 ADC $60
400 C5EA 852E                 STA $2E
410 C5EC 8530                 STA $30
420 C5EE 8532                 STA $32
430 C5F0 60                   RTS
```

Two Bits More for the 64

Listing 2. The DELETE keyword.

```
 10 033C          !*********************************
 20 033C          !*                               *
 30 033C          !*         DELETE  KEYWORD       *
 40 033C          !*                               *
 50 033C          !*    VERSION 1.0 -- 10/02/84    *
 60 033C          !*                               *
 70 033C          !* COPYRIGHT (C)  A.L.CROSS 1984 *
 80 033C          !*                               *
 90 033C          !*********************************
100 033C          !
110 033C          !
120 C5F1          *=$C5F1
130 C5F1          !
140 C5F1          !
150 C5F1          !VARIABLES AND EQUATES
160 C5F1          !
170 C5F1          LNKPTR      =  $A533
180 C5F1          FNDLIN      =  $A613
190 C5F1          NUMEXP      =  $AD8A
200 C5F1          POSINT      =  $B7F7
210 C5F1          TSTCOM      =  $AEFD
220 C5F1          PRTSTG      =  $AB1E
230 C5F1          PRTERR      =  $A465
240 C5F1          !
250 C5F1 E000     DELETE      CPX #$0                    !CHECK STATEMENT FLAG
260 C5F3 F003                 BEQ DODEL
270 C5F5 4C08AF               JMP $AF08
280 C5F8 208AAD DODEL         JSR NUMEXP                 !GET START LINE
290 C5FB 20F7B7               JSR POSINT
300 C5FE 2013A6               JSR FNDLIN                 !GET LINE ADDRESS
310 C601 9066                 BCC LINERR
320 C603 A560                 LDA $60                    !STACK ADDRESS
330 C605 48                   PHA
340 C606 A55F                 LDA $5F
350 C608 48                   PHA
360 C609 20FDAE               JSR TSTCOM
370 C60C 208AAD               JSR NUMEXP                 !GET END LINE
380 C60F 20F7B7               JSR POSINT
390 C612 2013A6               JSR FNDLIN                 !CHECK THAT LINE EXISTS
400 C615 9052                 BCC LINERR
410 C617 E614                 INC $14                    !INC LINE NUMBER
420 C619 D002                 BNE GETEND
430 C61B E615                 INC $15
440 C61D 2013A6 GETEND        JSR FNDLIN                 !GET END LINE+1
450 C620 68                   PLA                        !RECOVER START ADDRESS
460 C621 8514                 STA $14
470 C623 68                   PLA
480 C624 8515                 STA $15
490 C626 38                   SEC
500 C627 E560                 SBC $60                    !CHECK THAT START
501 C629 F004                 BEQ CHKLOW                 !ADDRESS IS LESS
510 C62B 9009                 BCC ADRSOK                 !THAN END ADDRESS
520 C62D B03A                 BCS LINERR
530 C62F A514     CHKLOW      LDA $14
540 C631 38                   SEC
550 C632 E55F                 SBC $5F
560 C634 B033                 BCS LINERR
570 C636 A000     ADRSOK      LDY #$0
580 C638 A52E     LOOP        LDA $2E
590 C63A C560                 CMP $60                    !END OF PROGRAM?
600 C63C D006                 BNE NOTEND
610 C63E A52D                 LDA $2D
620 C640 C55F                 CMP $5F
630 C642 F012                 BEQ PRGEND
640 C644 B15F     NOTEND      LDA ($5F),Y                !MOVE ONE BYTE
650 C646 9114                 STA ($14),Y                !DOWN
660 C648 E65F                 INC $5F
670 C64A D002                 BNE DODEST
680 C64C E660                 INC $60
690 C64E E614     DODEST      INC $14
700 C650 D0E6                 BNE LOOP
710 C652 E615                 INC $15
720 C654 D0E2                 BNE LOOP
730 C656 A514     PRGEND      LDA $14                    !SET NEW PROG END
740 C658 852D                 STA $2D
750 C65A 852F                 STA $2F
760 C65C 8531                 STA $31
770 C65E A515                 LDA $15
780 C660 852E                 STA $2E
790 C662 8530                 STA $30
800 C664 8532                 STA $32
810 C666 4C33A5               JMP LNKPTR
820 C669 A973     LINERR      LDA #<ERRMSG
830 C66B A0C6                 LDY #>ERRMSG
840 C66D 201EAB               JSR PRTSTG
850 C670 4C65A4               JMP PRTERR
860 C673 0D0A4C ERRMSG        BYT $0D,$0A,'L','I','N','E',$20
870 C67A 4E554D               BYT 'N','U','M','B','E','R',$00
```

Undoing a NEW is a two part process. The first bit involves relinking the list of lines. As it happens, part of the garbaging wrought upon BASIC text by the thunderbolt of NEW is to lay a few nulls on the first few bytes of BASIC memory. Nulls are what the 64 uses as the end of program marker. Unfortunately, the relinking routine will relink until it encounters a null, thinking it has linked its way to the end of the program. Hard luck, this, if the null is the first thing it encounters.

As such, the first thing to be done is to place some other value in the locations which have been nulled out. In this case, we'll use #$01, but any value will do.

Having done this, we can safely perform a call to LNKPTR, which, as noted a while back, will relink the BASIC lines. Because this routine works with the contents of the program rather than extrapolating a new link table from the old one, it can relink a program in which the existing table has been partially gorched.

Having reconstructed the program text, all that's required is to have the pointers put back into 64 the right way up, so as to get them to point to the top of the program again. The sneaky bit is in finding where the top of the program is. However, if you've been following this circus closely you'll already know the solution to this thorny problem.

We can't know what the last number in the program is, but if we call FNDLIN and have it look for the largest possible number, 65535, it will return with a pointer in $5F which looks at the end of the program in RAM. Well, in fact, it will point to the end shy two bytes, so it must be incremented twice. It can thereupon be stuck in the pointer register for the top of the program, and the deed will be done.

Mass Destruction

BASIC provides you with essentially two ways to remove offending or otherwise uncool lines from your program. The first is to type NEW, which, as we've seen, is partially impractical as it only removes the offending lines successfully if all of the lines offend you. The other is to delete them one at a time... a bit more selective, this, but tedious.

The upper class BASICs include a DELETE keyword, which is neat in that it can remove a whole swath of lines at a time. It is, of course, possible to add this useful keyword to a Commodore 64, as well... or we wouldn't have brought the whole thing up.

The code for DELETE is fairly straight up. To begin with, it calls FNDLIN to figure out where the text to be deleted starts, and where it ends. If either number turns out not to be real, it throws an error message and returns to command mode. Otherwise, assuming a set carry flag upon returning from the call, it pushes the address on the stack for safekeeping and carries on.

In extracting the address of the end line, the last line to be deleted, we have a slightly trickier problem than is the case with getting the address of the start line, inasmuch as the pointer returned by FNDLIN will point not to the end of that line, but to the beginning, which would mean that the line would be left in the program. As such, we must increment the line number of the end line by one so that FNDLIN overshoots, and points to the start of the next line.

Knowing the limits of the text to be removed it becomes a fairly simple matter to delete what's in the middle. The code simply copies the block of text starting above the end line and running to the end of the program over the deleted text. It then adjusts the pointer so that the top of BASIC pointer indicates the reduced address. New BASIC will overwrite the old data, which is no longer considered valid.

Patches and Hacks

These simple routines should serve not only to add some programming power to the 64's BASIC... they will also illustrate some of the techniques involved in getting the system's built in programs... the ROM routines... to work for you.

There are, of course, overflowing handfuls of other routines in the 64... we'll be looking at some of these another time. However, if you really want to you can start to find them yourself. Simply begin to disassemble the ROM. It's not too hard to figure out where one call ends and the next begins... there's an RTS at the end of most routines... and, given the page zero memory map and the other machine language information in the programmer's reference guide quite a lot of stuff can be unpacked from the core of the 64. **CN!**

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The best way to learn machine language programming the Apple II in no time at all. The book combines colour, graphics, and sound generation together with clear cut demonstrations to help the user learn quickly and effectively.

4

BP-109: THE ART OF PROGRAMMING THE 1K ZX81
M. JAMES and S.M. GEE **$7.60**
This book shows you how to use the features of the ZX81 in programs that fit into the 1K machine and are still fun to use. Chapter Two explains the random number generator and uses it to simulate coin tossing and dice throwing and to play pontoon,. Chapter Three shows the patterns you can display using the ZX81's graphics. It's animated graphics capabilities, explored in Chapter Four, have lots of potential for use in games of skill, such as Lunar Lander and Cannonball which are given as complete programs. Chapter Five explains PEEK and POKE and uses them to display large characters. The ZX81's timer is explained in Chapter Six and used for a digital clock, a chess clock and a reaction time game. Chapter Seven is about handling character strings and includes three more ready-to-run program — Hangman, Coded Messages and a number guessing game. In Chapter Eight there are extra programming hints to help you get even more out of your 1K ZX81.

5

SB21862-APPLE® INTERFACING **$16.95**
Describes the internal Apple II control signals available for I/O interfacing and shows you how to use them with Applesoft BASIC to control devices and communicate with other computers, modems, serial printers, and more. Furnishes real, tested interfacing circuits that work, plus complete breadboarding to help you check out your own interfacing ideas.

6

DESIGNING MICROCOMPUTER SYSTEMS
HB18: **$18.95**
POOCH AND CHATTERGY
This book provides both hobbyists and electronic engineers with the background information necessary to build microcomputer systems. It discusses the hardware aspects of microcomputer systems. Timing devices are provided to explain sequences of operation in detail. Then, the book goes on to describe three of the most popular microcomputer families: the Intel 8080. Zilog Z-80, and Motorola 6800. Also covered are designs of interfaces for peripheral devices, and information on building microcomputer systems from kits.

7

SB21846: ENHANCING YOUR APPLE® II — VOLUME 1
D. LANCASTER **$25.50**
Who but Mother Nature or Don Lancaster could successfully enhance an Apple? YOU can, with help from Volume 1 in Don's newest series for Sams Among other things, you'll learn (1) to mix text, LORES, and HIRES together anywhere on the screen in any combination, (2) how to make a one-wire modification that will open up whole new worlds of 3-D graphics and other special effects, plus (3) a fast and easy way to tear apart and understand somebody else's machine language program. Other goodies abound!

8

BP86: AN INTRODUCTION TO BASIC PROGRAMMING TECHNIQUES **$7.75**
This book is based on the author's own experience in learning BASIC and in helping others, mostly beginners, to program and understand the language. Also included are a program library containing various programs. Also included are a program library containing various programs, that the author has actually written and run. These are for biorhythms, plotting a graph of Y against X, standard deviation, regression, generating a musical note sequence and a card game. The book is complemented by a number of appendices which include test questions and answers on each chapter and a glossary.

9

PH131: ZAP! POW! BOOM!
ARCADE GAMES FOR THE VIC 20
T-HARTNELL & M. RAMSHAW (1983) **$16.95**
Move through the maze eating dots with MAZEMAN. Sail through space zapping the ASTROIDS Outshoot the fastest draw in town GUNFIGHT. Owners of the VIC 20 can now play these games — and more — simply by following the programs outlined in this handy guide.

10

SB21959: THE APPLE® II CIRCUIT DESCRIPTION **$32.50**
Provides you with a detailed circuit description of the Apple II motherboard, including the keyboard and power supply. Comes complete with timing diagrams for major signals and discussion of differences between the various revisions. Good for technicians, serious hobbyists, and others with some knowledge of digital hardware.

See Order Form on page 87

BEGINNERS

BP115: THE PRE-COMPUTER BOOK $7.60
Aimed at the absolute beginner with no knowledge of computing, this entirely non-technical discussion of computer bits and pieces and programming is written mainly for those who do not possess a microcomputer but either intend to one day own one or simply wish to know something about them.

A CONSUMER'S GUIDE TO PERSONAL COMPUTING AND MICROCOMPUTERS, SECOND EDITION
FREIBERGER AND CHEW
HB14 $15.95
The first edition was chosen by Library Journal as one of the 100 outstanding sci-tech books of 1978. Now, there's an updated second edition!

Besides offering an introduction to the principles of microcomputers that assumes no previous knowledge on the reader's part, this second edition updates prices, the latest developments in microcomputer technology, and a review of over 100 microcomputer products from over 60 manufacturers.

THE ESSENTIAL COMPUTER DICTIONARY AND SPELLER
AB011 $9.95
A must for anyone just starting out in the field of computing, be they a businessman, hobbyist or budding computerist. The book presents and defines over 15,000 computer terms and acronyms and makes for great browsing.

BEGINNER'S GUIDE TO COMPUTER PROGRAMMING
TAB No.574 $15.95
Computer programming is an increasingly attractive field to the individual, however many people seem to overlook it as a career. The material in this book has been developed in a logical sequence, from the basic steps to machine language.

HB131: THE BEGINNER'S GUIDE TO BUYING A PERSONAL COMPUTER $5.95
Written for the potentially interested computer buyer, in non-technical language, this affordable book explains the terminology of personal computers, the problems and variables to be discussed and discovered while making that initial buying decision. The book does not make recommendations, but does present a great deal of information about the range of hardware avialable from the largest personal computing manufacturers. Readers discover the meaning and impact of screen displays, tape cassette storage and disk storage, graphics and resolution, and much more. Comparison charts clearly define standard and optional features of all the current mass market personal computers.

MICRO-PROCESSORS

A BEGINNER'S GUIDE TO COMPUTERS AND MICROPROCESSORS — WITH PROJECTS.
TAB No.1015 $13.95
Here's a plain English introduction to the world of microcomputers — it's capabilities, parts and functions . . . and how you can use one. Numerous projects demonstrate operating principles and lead to the construction of an actual working computer capable of performing many useful functions.

BP66: BEGINNERS GUIDE TO MICROPROCESSORS AND COMPUTING $7.50
E.F. SCOTT, M.Sc., C.Eng.
As indicated by the title, this book is intended as an introduction to the basic theory and concepts of binary arithmetic, microprocessor operation and machine language programming.

There are occasions in the text where some background information might be helpful and a Glossary is included at the end of the book.

BP72: A MICROPROCESSOR PRIMER $7.70
E.A. PARR, B.Sc., C.Eng., M.I.E.E.
A newcomer to electronics tends to be overwhelmed when first confronted with articles or books on microprocessors. In an attempt to give a painless approach to computing, this small book will start by designing a simple computer and because of its simplicity and logical structure, the language is hopefully easy to learn and understand. In this way, such ideas as Relative Addressing, Index Registers etc. will be developed and it is hoped that these will be seen as logical progressions rather than arbitrary things to be accepted but not understood.

HANDBOOK OF MICROPROCESSOR APPLICATIONS
TAB No.1203 $15.95
Highly recommended reading for those who are interested in microprocessors as a means of a accomplishing a specific task. The author discusses two individual microprocessors, the 1802 and the 6800, and how they can be put to use in real world applications.

BP102: THE 6809 COMPANION $7.60
M. JAMES
The 6809 microprocessor's history, architecture, addressing modes and the instruction set (fully commented) are covered. In addition there are chapters on converting programs from the 6800, programming style, interrupt handling and about the 6809 hardware and software available.

SB21877: MICROPROCESSOR CIRCUITS, VOLUME 1: FUNDAMENTALS AND MICROCONTROLLERS $13.95
Intended for service technicians, computer technicians, industrial control personnel, students, hams, and others who need to learn microprocessor basics. Brings you a chance to learn microprocessor theory and gain valuable practical experience at the same time! Excellent for home study and in-plant training. Features actual demonstration circuits easily built with solderless boards and readily available chips and parts.

AN INTRODUCTION TO MICROPROCESSORS EXPERIMENTS IN DIGITAL TECHNOLOGY
HB07: $18.95
SMITH
A "learn by doing" guide to the use of integrated circuits provides a foundation for the underlying hardware actions of programming statements. Emphasis is placed on how digital circuitry compares with analog circuitry. Begins with the simplest gates and timers, then introduces the fundamental parts of ICs, detailing the benefits and pitfalls of major IC families, and continues with coverage of the ultimate in integrated complexity — the microprocessor.

DIGITAL INTERFACING WITH AN ANALOG WORLD
TAB No. 1070 $15.95
You've bought a computer, but now you can't make it do anything useful. This book will tell you how to convert real world quantities such as temperature, pressure, force and so on into binary representation.

MICROPROCESSOR INTERFACING HANDBOOK: A/D & D/A
TAB No.1271 $15.95
A useful handbook for computerists interested in using their machines in linear applications. Topics discussed include voltage references, op-amps for data conversion, analogue switching and multiplexing and more.

BASIC

BASIC COMPUTER PROGRAMS IN SCIENCE AND ENGINEERING
GILDER
HB08 $19.95
Save time and money with this collection of 114 ready-to-run BASIC programs for the hobbyist and engineer. There are programs to do such statistical operations as means, standard deviation averages, curve-fitting, and interpolation. There are programs that design antennas, filters, attenuators, matching networks, plotting, and histogram programs.

SB22047: 26 BASIC PROGRAMS FOR YOUR MICRO $16.95
Features 26 previously unpublished, simple-to-complex games you can run on almost any brand of microcomputer as long as you have enough RAM on board. Most take between 500 and 5000 bytes, with the highest taking 13K. Conversion charts that let you key them into your Radio Shack, TRS-80, Apple II, Timex/Sinclair 1000 (ZX81), Spectrum, Atari, or PET are included. Also features notes on program techniques and structures.

Tab1533: GRAPHICS PROGRAM IN MICROSOFT BASIC $19.25
Generate computer art including mathematically defined art and animated graphics; draw still pictures — realistic and abstract; create an interactive space shuttle simulation; plot architectural and landscape drawings with both high and low resolution graphics; construct a 3-dimensional model of a function; plot 2-dimensional graphics, statistical relations, maps and diagrams. All these are written in Microsoft BASIC that is adaptable to just about any BASIC micro system.

THE MOST POPULAR SUBROUTINES IN BASIC
TAB No.1050 $10.95
An understandable guide to BASIC subroutines which enables the reader to avoid tedium, economise on computer time and makes programs run faster. It is a practical rather than a theoretical manual.

COMPUTER PROGRAMS IN BASIC
AB001 $14.95
A catalogue of over 1,600 fully indexed BASIC computer programs with applications in Business, Math, Games and more. This book lists available software, what it does, where to get it, and how to adapt it to your machine.

THE BASIC COOKBOOK.
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BASIC is a surprisingly powerful language . . . if you understand it completely. This book, picks up where most manufacturers' documentation gives up. With it, any computer owner can develop programs to make the most out of his or her machine.

BASIC FROM THE GROUND UP
SIMON
HB15 $19.95
Here's a BASIC text for high school students and hobbyists that explores computers and the BASIC language in a simple direct way, without relying on a heavy mathematical backbround on the reader's part. All the features of BASIC are included as well as some of the inside workings of a computer. The book covers one version of each of the BASIC statements and points out some of the variations, leaving readers well prepared to write programs in any version they encounter. A selection of exercises and six worked out problems round out the reader's experience. A glossary and a summary of BASIC statements are included at the end of the book for quick reference.

MISCELLANEOUS

Z-80 AND 8080 ASSEMBLY LANGUAGE PROGRAMMING
SPRACKLEN
HB05 $18.95
Provides just about everything the applications programmer needs to know for Z-80 and 8080 processors. Programming techniques are presented along with the instructions. Exercises and answers included with each chapter.

Tab 1389: MACHINE AND ASSEMBLY LANGUAGE PROGRAMMING $14.95
This book assumes no prior programming knowledge and starts by explaining the advantages of ML. Several sample programs are included and each chapter ends with a quiz to check your understanding of that section.

SARGON: A COMPUTER CHESS PROGRAM SPRACKLEN
HB12 $27.50
"I must rate this chess program an excellent buy for anyone who loves the game. "Kilobaud.

Here is the computer chess program that won first place in the first chess tournament at the 1978 West Coast Computer Faire. It is written in Z-80 assembly language, using the TDL macro assembler. It comes complete with block diagram and sample printouts.

PH180: 1983 CANADIAN BUSINESS GUIDE TO MICRO-COMPUTERS
K. DORRICOTT $11.95
Written by the managing director of Deloitte, Haskins & Sells, a Canadian partnership of public accountants and other professional advisors to management, this book is one of the most complete comprehensive guides to microcomputers available. Starting with a general overview of microcomputers and their business applications, the author helps you assess your computer needs, compares and evaluates computer systems and application packages, and gives you tips on "doing it right". A must for anyone thinking of purchasing a microcomputer for business.

HOW TO PROFIT FROM YOUR PERSONAL COMPUTER: PROFESSIONAL, BUSINESS, AND HOME APPLICATIONS
LEWIS
HB01 $18.95
Describes the uses of personal computers in common business applications, such as accounting, managing, inventory, sorting mailing lists, and many others. The discussion includes terms, notations, and techniques commonly used by programmers. A full glossary of terms.

PH181: THE DATA BASE GUIDE
C.BENTON $26.00
Complete step-by-step book detailing the necessary elements for selecting organizing and implementing database systems for microcomputers. Presents material at a beginner's level yet thorough enough to aid the professional data processing person.

BUSINESS

PH203: THE POWER OF MULTIPLAN™ MANAGEMENT INFORMATION SOURCE $19.95
Covers Accounts receivable, invoicing, cost recovery production scheduling estimating, checkbook, and engineering problem solving accounts payable, payroll, monthly sales report, inventory and financial forecast.

PH206: dBASE II USER'S GUIDE
A. GREEN $38.00
This instructional handbook for novices and experienced users alike presents a simple, highly effective approach to learning how to use this powerful software program avialable for microcomputers.

BASIC COMPUTER PROGRAMS FOR BUSINESS: STERNBERG (Vol. 1)
HB13 $21.50
A must for small businesses utilizing micros as well as for entrepreneurs, volume provides a wealth of practical business applications. Each program is documented with a description of its functions and operation, a listing in BASIC, a symbol table, sample data, and one or more samples.

GENERAL

S-100 BUS HANDBOOK
HB19: $25.50
BURSKY
Here is a comprehensive book that exclusively discusses S-100 bus computer systems and how they are organized. The book covers computer fundamentals, basic electronics, and the parts of the computer. Individual chapters discuss the CPU, memory, input/output, bulk-memory devices, and specialized peripheral controllers. It explains all the operating details of commonly available S-100 systems. Schematic drawings.

See Order Form on page 87

Moorshead Publications Software Services

Stockboy Inventory Control Package

When we first advertised this program, we would have been pleased with a fraction of the orders we received. On reflection we should have appreciated what a bargain it is. Inventory programs are generally pretty expensive and some of them are inflexible and some even badly engineered. You may find that even small inventories generate enrormous files.

Stockboy is a good, powerful, flexible bargain-priced package which will handle inventory for small businesses. We use Stockboy within Moorshead Publications for our own inventory control and it has stood the test of time.

Stockboy can:

- **Maintain an inventory database with current, maximum and minimum stock reporting when an item needs re-ordering.**
- **Be a point of sale terminal, adjusting the stock data base on line.**
- **Produce individual packing lists.**
- **Generate a customer list to be used in mass mailings.**
- **Run on any CP/M or MS-DOS based computer, even an Apple II running with a softcard.**

Stockboy is written in Microsoft BASIC, and is designed to be easily altered to suit your needs. It can be compiled using BASCOM if you desire. It is designed for use by non-technical operators.

Available for: CP/M and PC formats

$29.95 most systems **$34.95** for 8"

Ontario residents add 7% PST.

MDM730

MDM730 is one of the most powerful MODEM7 programs available . . . and the Computing Now! version of MDM730 incorporates features not available in the public domain editions. If you are into telecommunications, bulletin boards and downloading software your life will be full and meaningful with this code. For background on MDM730, see July 1984 Computing Now!. Consider the facilities.

- Terminal program which works at any baud rate.
- Ten programmable macro function keys.
- Thirty six number phone library.
- Christensen software transfer protocol.
- User settable toggles for line feeds, ON-XOFF and so on.
- Extensive help menus.
- Baud rate selection on the fly (or the spider).
- ASCII dump and capture.
- Status menu
- Many more features.

In addition to all this splendor, however, we've added dialing support for the Apple version. While the standard MDM730 cannot dial unless it's hooked to a Hayes Smartmodem, we've added patches to it to allow it to do pin twenty five pulse dialling and to dial through the Hayes Micromodem II and the SSM card. The Computing Now! MDM730 will also

- Select a number from the library and dial it
- Accept a hand entered number and dial it
- Wait for carrier
- Log you onto the remote system if it's free
- Optionally autodial if the remote board is busy.
- Count the number of attempts at dialling the remote BBS.

The Computing Now! MDM730 package is available for

- The Hayes Micromodem II.
- The SSM 300 Baud modem card.
- The PDA 232C serial card with external modem.

The PDA 232C package includes versions supporting both the Smartmodem and a dumb modem with pin twenty five line control, such as the Novation AutoCat.

Also included with each package are utilities to permit easy alteration of the phone number library and the function key macro strings plus an extensive documentation file.

The source code file for this program is over a hundred and fifty kilobytes long. It cannot be hacked on a standard Apple. We patched it on a larger machine and downloaded it. As such, we're pretty sure that MDM730 with these features is unavailable elsewhere.

Available for: Apple II + CP/M 2.2. systems

TRS-80 Model II (complete with the above applicable features)

Please specify modem version from above list. **$29.95**

Ontario residents add 7% PST.

Fine Print:
The original MDM730 code is in the public domain. We are offering this part of the program without cost. The charges for this package are for the patches created by Computing Now! and to defer the cost of handling and postage.

This software is guaranteed to work correctly if properly applied. The serial cards on Apple and compatible systems must be installed in slot two with at least 48K of RAM running Microsoft CP/M 2.2. The PDA 232C version will require the availability of either a Hayes Smartmodem or a modem with pin twenty five line control to dial. Users of the SSM card version may experience some difficulty in detecting extremely faint carriers on older versions of this card.

Formats

Where **CP/M** is shown, the following formats are available:

Apple II + CP/M (see below)
Access Matrix, Morrow Micro Decision, Superbrain, Xerox/Cromenco*, Epson QX-10VD, Sanyo MBC1000, Nelma Persona, Kaypro II, Osborne Single Density*, Osborne Double Density, Systel/Olympia, 3R Avatar, Attache, Televideo, Lobo Max-80*, DEC VT-180, Casio FP-1000, Micromate, Zorba, 8 inch SSSD*

*Software marked with an asterisk is the higher price quoted.

MDM730 for the Apple II + CP/M requires two disks and is at the higher price.

PC
Available for the IBM PC and genuine compatibles.

AppleDOS
For Apple II + and genuine compatible systems.

TRS-80 Model II CP/M
Will operate under either Lifeboat or Pickles and Trout CP/M.

Apple Wordstar Fixer

Apples and Wordstar are not entirely friendly. Apple compatible systems equipped with Videx type eighty-column cards do a number of unpleasant things to this popular word processor. While there are simple cures for this... they all involve some delicate code hacking.

The Fixer solves this problem. Place it on the same disk as your copy of WS.COM, type FIXER and after a suitable amount of disk noise, you will have APWS.COM on there too. This version of Wordstar includes special patching and unhooking code which runs each time you boot Wordstar, and makes your fruit behave as it should. It releases the control K's, translates the left arrow key to a delete character, and patches Unitron keyboards.

In addition, the fixer allows you to set some of the defaults of Wordstar which the MicroPro INSTALL package doesn't really get to. All of these features are menu driven in English for absolute non-technical operation.

Will run in either 44K or 56K CP/M.

Available for:
Apple II + CP/M only. **$19.95**

Ontario Residents add 7% P.S.T.

DOSDIAL

The Apple Terminal Package

There are plenty of terminal programs for the Apple II and its emulators. Some dial, some download. However, only DOSDIAL is this splendidly cheap.

DOSDIAL is a hybrid Applesoft and machine code package for fast operation and easy modification. It features a phone number library and automatic dialing. It operates on any fruit with a PDA 232C serial card and an autodial modem. A complete source file of the assembler code is included to allow it to be quickly patched for other serial cards.

Will work on any Apple + or compatible system with a PDA 232C serial card and an autodial modem.

Available for:
Apple II + **$16.95**

Ontario residents add 7% PST

A Teacher for the Apple

Specifically developed for the educational market, this 5-1/4" disk introduces both teachers and students to the Apple +, IIe and compatible systems.

It is designed to show you how to make the computer work for you.

After introducing you to the computer, it goes on to explain the BASIC programming language and step-by-step instructions show you the ins-and-outs of programming this system and using its many features including disk operating systems and high resolution graphics.

This program is designed for the total novice and it is designed to work accordingly. All you do is turn the computer on, slide in the disk and it takes over!

Requires Applesoft BASIC, 48K RAM and one disk drive.

Available for:
AppleDOS only **$35.00**

Ontario residents add 7% PST.

Software Services,
Moorshead Publications
25 Overlea Boulevard, Suite 601
Toronto, Ont. M4H 1B1

COMPUTER PRESS

ParityPlus Inc. is distributing Mountain Computer's DOS 3.0 compatible **AT Filesafe Tape Back—Up**s for the IBM PC AT. Two models are offered, one with 27 megabytes formatted tape back-up, the other model with a capacity of 60 megabytes...

Pop—Ups don't spring from your toaster, but rather from *Bellsoft Incorporated.* Handy utilities that reside in IBM PC RAM to be accessed while other applications are running, some titles include a calendar, an interrupt-driven DOS, a notepad and a calculator. A Pop-Up Alarm Clock utility accompanies each module...

Commodore 64 users with a light pen and a perchant for animation may be interested in *Tech—Sketch, Inc.*'s **Lite—Sprite**. Using magnification, sprites can be manipulated and stored in sequences of up to 128 frames'...

The Persyst **BoB Super Display Adapter** is being distributed in Canada by *J.B. Marketing of Canada, Limited*. Coupled with a suitably high resolution monitor and an IBM PC, the adapter provides high resolution alphanumeric text, sharp high and medium resolution graphics, and programmable character sets...

Enhancement Technology Corporation has begun shipping **PD-QBASIC+**, an Applesoft BASIC compatible compiler to complement their PDQ Super-32 System co-processor. Written for the Apple][series of computers, the compiler can operate under either DOS 3.3 or ProDOS...

A Hayes-compatible modem, the **Info—Mate 1200**, is available from *Cermetek Microelectronics*. Capable of operating at 110/300/1200 bits per second, the modem supports auto-dial, auto-answer and auto-speed select from either keyboard or software, and it has an inherent adjustable speaker...

Sunol Systems' **Sun*Mac** interface for the Macintosh computer implements Apple Computer's AppleBus networking protocol. Distributed by *McKenzie Brown Limited*, the interface will allow up to 32 Macs to communicate. When connected to a Sun*Disk, the network can share from eight to 92 megabytes storage per disk...

COMPUTER PRESS

//c Bundling

MARKHAM, ONTARIO — Anticipating the fall and holiday seasons, *Apple Canada* has lowered the retail price of the **Apple //c** to $1,795 from $1,895 and has announced a specially priced hardware bundle to accompany the //c.

The bundle, which includes the //c, the Monitor //c and the Monitor //c stand is retailing for $1,995, a savings of more than $250 when all items are purchased separately.

IBM users with more storage needs than average may take interest in the **Evron IBM PC Mass Storage System.** Drive capacity can be anywhere from 50 to 1350 megabytes, or more with combinations of either fixed and/or removable media. The systems are available from *Evron Computer Systems Corporation...*

The **SX—68 cross assembler** is a software package that allows alternative software development for the MC68000 microprocessor. Produced by *Allen Systems*, the editor and two-pass assembler is available for 64K Apple][computers...

An intelligent printer interface for the Commodore 64, the **Grappler CD** is being distributed in Canada by *Peripherals Plus Inc.* The interface has a Commodore 1525 emulation mode, its own serial and expansion ports, and provides a wide variety of high resolution and block graphics printing options...

Penguin Software has released **Cat Graphics** for the Apple][computers. The program makes 108 colours available in standard high resolution, and 256 in double hires. PEEKs, POKEs and CALLs for graphics and sound have been done away with, and a variety of drawing commands are inherent...

The *Amdek* **Color 500** monitor provides both RGB video and NTSC composite outputs, as well as an auxiliary mode to display inputs from a video recorder. The high resolution monitor can display crisp 80 x 25 text in RGB mode, and has a built-in speaker...

Taking note of the Apple //c's 128K memory, *Arrays, Inc.* is offering **The Home Accountant Expanded** for the //c and the 128K //e computers. 80 column capability, optional mouse usage and ProDOS format are some of the advantages of this release...

Addresses: Allen Systems, 2151 Fairfax Road, Columbus, Ohio 43221 (614) 488-7122 ● Evron Computer Systems Corporation, 5 Denison Street, Markham, Ontario L3R 1B5 (416) 477-0444 ● Peripherals Plus Inc., 350 des Erables, Lachine, Quebec H8S 2P9 (514) 364-5554 ● Penguin Software, 830 4th Avenue, P.O. Box 311, Geneva, Illinois 60134 (312) 232-1984 ● Hewlett-Packard, 6877 Goreway Drive, Mississauga, Ontario L4V 1M8 (416) 678-9340 ● Alternative Decision Software, Incorporated, 11 Robinwood Court, Lancaster, New York 14086 (716) 683-4603 ● Technical Logistics Support Limited, 345 Nugget Avenue, Unit 18, Scarborough, Ontario M1S 4J4 (416) 293-9481 ● Arrays, Inc./Continental Software, 11223 South Hindry Avenue, Los Angeles, California 90045 (213) 410-3977 ● ParityPlus Incorporated, 1495 Bonhill Road, Unit 12, Mississauga, Ontario L5T 1M2 (416) 673-3321 ● Bellsoft, Incorporated, 2820 Northup Way, Bellevue, Washington 98004 (206) 828-7282 ● Tech-Sketch, Incorporated, 26 Just Road, Fairfield, New Jersey 07006 (201) 227-7724 ● J.B. Marketing of Canada Limited, P.O. Box 422, Cornwall, Ontario K6H 5T2 (613) 938-3333 ● Enhancement Technology Corporation, P.O. Box 1267, 17 Keeler Street, Pittsfield, MA 01202 (413) 445-4219 ● Cermetek Microelectronics, Incorporated, 1308 Borregas Avenue, P.O. Box 3565, Sunnyvale, California 94088-3565 (408) 734-8150 ● McKenzie Brown Limited, 267 Richmond Street West, Toronto, Ontario M5V 1W9 (416) 593-6880 ● Amdek Corporation, 2201 Lively Boulevard, Elk Grove Village, Illinois 60007 (312) 595-6890

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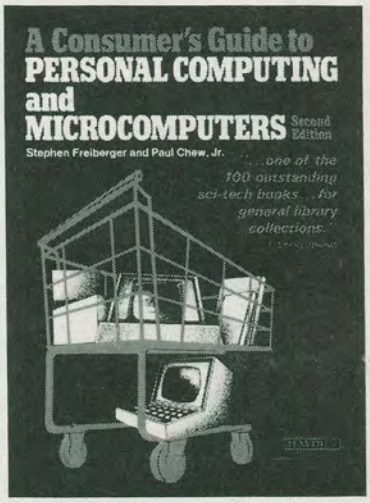

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The Bitcracker

As with most of the performing arts, ballet has a language... both oral and written... all its own. The written form, a complex notation of steps, has recently found itself waking up inside a computer. Join us now in the dance of the Macintosh.

by Frank Lenk

You've probably never wondered how ballet choreographers manage to record their brilliant dance steps for posterity. It isn't the question burning like a live ember on the lips of the common man, I know. However, needless to say, it's important to choreographers... and, as it turns out, quite interesting for the rest of us, cultureless heathens that we be.

In fact, until recently, ballet was recorded on paper using a labourious notation to represent an art with, virtually, as many variations as can be executed with a human body. However, even in this discipline, perhaps as far removed from technology as one can imagine, microcomputers are turning up. The problems of dancing feets and binary feats have become somewhat entangled with one another, partially through the efforts of the Ontario Science Centre.

As part of its *Artist as a Young Machine* show, the Science Centre hired the services of a number of dancers... including Robyn Ryman... and of Doug Moen, a computer science student at Waterloo University. Doug was given the use of two machines... a *Lisa* and a *Macintosh*... purely for the purpose of developing the first true "word processor" for choreographers.

Doug has managed to make a sizable dent in this task. What he achieved... and how he did it... are quite revealing of the potentials of microcomputers to apply themselves to the arts.

Historical Footing

You may never have actually been to the ballet. You probably don't know what you're missing... imagine a whole stage full of gorgeous women leaping around in cloths that you only normally get to see in those magazines one reads sideways... in private. What's more, it's actually reasonably refined.

"We saw Clint Eastwood shoot a hundred and twelve people last night. What's you do?"

"Oh, we were at the ballet."

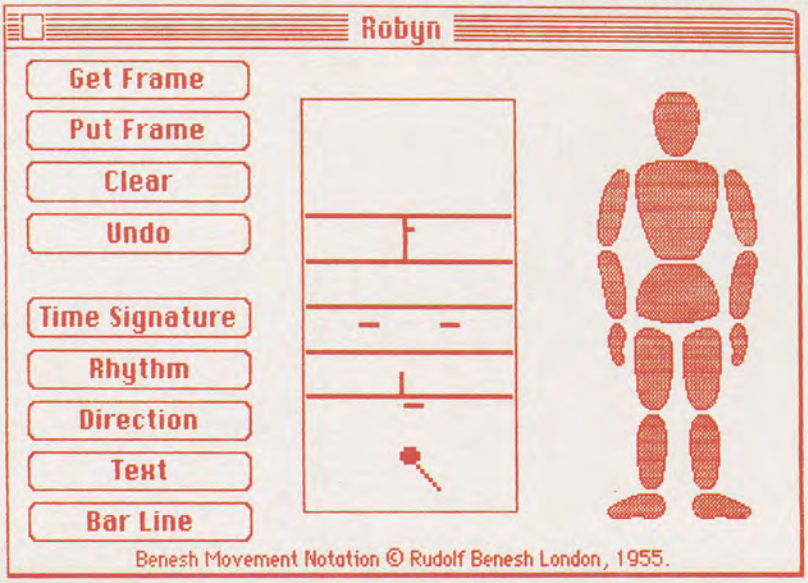
This alone is an experience few would want to forsake.

If you have in fact experienced the joys terpsichorean you may have found occasion to wonder just how these marvellous movements have been handed down over the centuries. To anyone familiar with musical notation, it seems obvious that there must exist... hidden away by some secret society of dancers... a similar choreographer's shorthand.

Various systems of choreographic notation have been in use since the sixteenth century or thereabouts. Unfortunately, application of these early systems was haphazard. Numerous mutually incompatible systems came and went... think of it as renaissance software. Frequently, no notation was made at all. By and large, dance steps had to be handed down by word of mouth... or word of foot.

Of course, this simple method persists today. Nothing can replace the personal touch of the master.

Since the start of the twentieth century there has been a proliferation of choreographic notation systems. One of the earliest systems to gain international



The Bitcracker

popularity was the Laban notation, developed in the twenties and still practised by many freelance notators. Dozens of other systems have arisen since Laban, with Eshkoll/Wachmann being one of the latest.

Our tale actually concerns a system originated in 1947, by one Rudolf Benesh. The canned description of it goes "This notation was developed through concepts drawn from music notation, perspective drawing and scientific disciplines including ergonomics, information theory, cybernetics and linguistics." Partly through the intervention of Dame Margot Fonteyn, the Benesh Movement Notation was adopted in 1955 for the recording of England's Royal Ballet Company repertoire. The system is now promoted by the Institute of Choreology in London.

Computer Cotillion

Most writers are already pretty well clued in to the wonders of word processing. Musicians too are beginning to discover the power of composing on micro. It probably hasn't occurred to you to ask what's being done for choreographers.

Obviously, the world is not exactly overpopulated with choreographers. This makes them a low priority market on most software developers' lists. Fortunately, the Ontario Science Centre chose to host a computer art show... the aforementioned *Artist as a Young Machine*... for its 1984 summer season. In the course of assembling every sort of electronic artist imaginable, the Centre did not forget to include representation from the world of the dance.

In May, Doug Moen started working on a program that would allow the Benesh "choreologist"... or even a mere dancer... to quickly and easily code a series of dance movements.

As it turned out, the Apple *Macintosh* was about as ideal for this as he could have hoped for. The whole problem with Benesh notation... from the computing point of view... is that it is pictographic. Several simple symbols are used to represent major parts of the body. Each of the dancers' poses is coded separately, just as each instrument in an orchestral score is given its own staff.

In musical notation, each position on the five staff lines represents a different note. In Benesh, each line of the staff is used to code a different position above the stage. Thus, a black dot on the second line from the bottom would represent a foot, somewhat raised off the stage.

Normally a line represents a hand or foot. Using a dot means that this appendage is actually hidden behind another part of the dancer's body. Plus signs show bent elbows or knees, while *X* corresponds to the dot, meaning a bent joint hidden from the audience's view. The accompanying illustrations should sort of clarify this.

The catch is that drawing all these little noughts and crosses can be a tad tedious... it can take up to six hours to notate all the parts for a single minute of a complex dance.

The Mac, being heavily graphics oriented, is ideal for representing these sorts of doodles.

Doug, working with the dancers, used the screen graphics to display a mannequin like model of the dancer's body. Wielding the inevitable mouse, the user selects a part of this body model, thereby exposing a second level pull down menu showing the choice of the *normal, hidden* or *bent* symbols. Once chosen, the symbol will appear on a narrow enlarged section of a staff right next to the mannequin figure.

Next to the working staff display is the main frame menu. Assuming that the symbols are correctly positioned, this menu is used to *put frame* into the growing sequence on the main staff page. This page... the actual document being processed... can be seen underneath the frame display by manipulating the usual window size controls with the mouse. Other frame menu options allow the user to undo an operation, to clear the document page, or to add a time signature, rhythm, or text notations to the document.

So far there is no facility for adding phrasing marks... as in music, arc lines drawn above or below the staff. Also, the Benesh language is kind of open ended; there is no complete dictionary, so it's almost impossible to include every possible symbol in the computer program. However, the beauty of the Mac system is that the basic Benesh document can easily passed over to the stock MacDraw program for further embellishment.

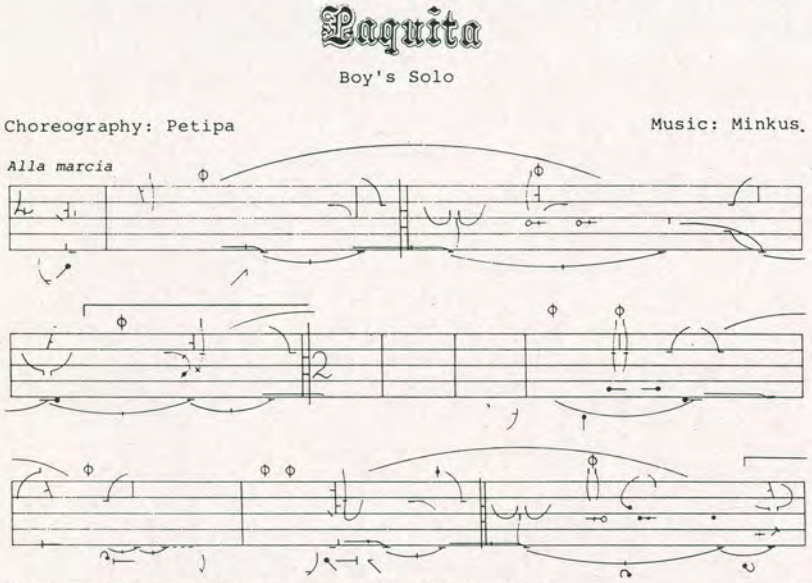
Pascal Polka

In operation, the whole program looks so wonderfully simple. Virtually anything running on the Mac looks this way. This makes for an interesting contrast... between running software on the Mac, and creating software for it.

The distinction between these two prepositions is one indication of this contrast. Programs that can be run on the Mac are not necessarily best created on that same machine. Mostly this is a matter of memory... a well documented deficiency of the present Mac configuration. Realize, for starters, that one graphic screen gobbles up twenty two K of RAM. With only a hundred and twenty eight K to fool around in, a second machine... preferably a Lisa... is practically essential for Mac programming.

Being somewhat new to the market and somewhat esoteric to software developers, the Mac is not overendowed with programming tools. For the Benesh project, Apple Pascal was a forced choice. By any standards Lisa Pascal is a bit of a trial to the patience.

Development of programs for both Lisa and Mac is performed by something called the *Workshop*. Booting *Workshop* is like a



Part of a choreographical score, as done by the Mac.

hit of deja vu to anyone who has ever used Pascal on the Apple II. Gone are all the icons, windows, mice and any other warm, furry creatures. Instead one is greated coldly by the spartan Pascal screen... essentially a blank, save for a row of menu options across the top of the display.

You may have caught the television ad wherein the complete library of congress thuds to earth next to an IBM PC, compared with the thin brochure that wafts down next to the Macintosh. That document may show the new user how to plug the machine in, or which end of the mouse to grab. It doesn't begin to talk about how to program the thing.

All those powerful screen functions... windows, icons, pull down menus... reside in a ROM known as the *tool kit*. Using the capabilities of this package while insulated by a higher level program can be quite exhilarating. However, implementing the tool kit functions from a low level, and harnessing them to do your bidding, is anything but trivial.

The key to the mysteries actually resides in two three inch thick eight and a half by eleven binders. According to Doug Moen, at least, you can expect to commit a large proportion of the contents of these binders to memory before you actually get a professional application program off the ground.

Most of the toolkit magic is invoked by means of *resource files*. For instance, windows are typically defined using four number codes specifying the size and location of the desired portal. That would seem to be fairly comprehensible, except that the numbers refer to pixel co ordinates... which you have to work out for yourself, on graph paper. For the Benesh program, Doug generated several pages of resource printouts, all virtually hand coded in this manner. There is talk of a resource editor being on the way, which would be a major improvement in the whole programming process.

The ROM routines, according to Doug, are very tightly written, and for the most part do their job exceedingly well. However, the old question of memory once more comes up to haunt the Mac. About half the ROM routines use dynamic memory allocation, handled in turn by another ROM routine... the memory manager routine. This thing apparently does not issue a trappable error message when the memory runs out. This means that while an application is running with seemingly ample elbow room, it can unexpectedly crash as a result of invoking a memory hungry routine from the ROM. It is up to the programmer to get around this by designing his own ceiling detection schemes.

In spite of all this, the would be mouse wielder should not be dismayed. Doug Moen, who has as much reason to be frustrated with the Mac as anyone, says that he would still prefer the machine over the PC. Although the Mac is more trouble to learn, he says, the results are that much more worthwhile.

It's hard to disagree, having seen a ballerina with absolutely no computer knowledge gracefully swinging the mouse hither and yon, swiftly churning out dance notations that might have taken even an expert many hours to do manually. **CN!**

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20 ' PROGRAM TO CALCULATE '
30 '  COMPOUNDED MONTHLY  '
40 ' by Takis Zourntos /84'
50 '       08/17/1984     '
60 '  Copyright (c) 1984  '
70 '-----------------------'
80 CLS:KEY OFF
90 LINE (0,0)-(719,300),4,B
100 '--Defines
110 CR$=CHR$(13):LF$=CHR$(10)
120 LS$=SPACE$(9):GS$=LS$+LS$
130 '--Brain
140 GOSUB 200 'Intro...
150 GOSUB 230 'Questions...
160 GOSUB 300 'Output.
170 LOCATE 25,15:PRINT LS$ "---Press <RETURN>---"
180 BEEP:BEEP:A$=INPUT$(1):IF A$=CR$ THEN 190 ELSE 180
190 CLS:LIST:END
200 '--Introduction
210 PRINT GS$ LS$ "COMPOUNDED MONTHLY" CR$ LF$ GS$ LS$"------------------"
220 RETURN
230 '--Questions
240 PRINT CR$ LF$ CR$ LF$
250 LINE INPUT "Enter the name of your company :";CONAM$
260 INPUT "Enter the amount of money you're investing ($) :",MONEY
270 INPUT "Enter the interest rate, per year (%) :",INRATE
280 INPUT "Enter the number of months the money stays in bank :",MONTHS
290 RETURN
300 '--Final output
310 CLS 2
320 PRINT CR$ LF$ CONAM$:FOR NUM=1 TO LEN(CONAM$):PRINT "-";:NEXT
330 PRINT CR$ LF$ CR$ LF$ GS$ "Value of Investment Compounded Monthly" CR$ LF$ G
S$ LS$"---------------"CR$ LF$ CR$ LF$ "Original amount : ";MONEY LS$ "Interest
rate : ";INRATE;"%"
340 PRINT CR$ LF$ CR$ LF$ ," Months" , " Balance" CR$ LF$ ," ------","  -------"
350    FOR TIME = 1 TO MONTHS
360        MONEY = MONEY * INRATE / 1200 + MONEY
370        PRINT ,TIME,MONEY
380    NEXT
390 RETURN
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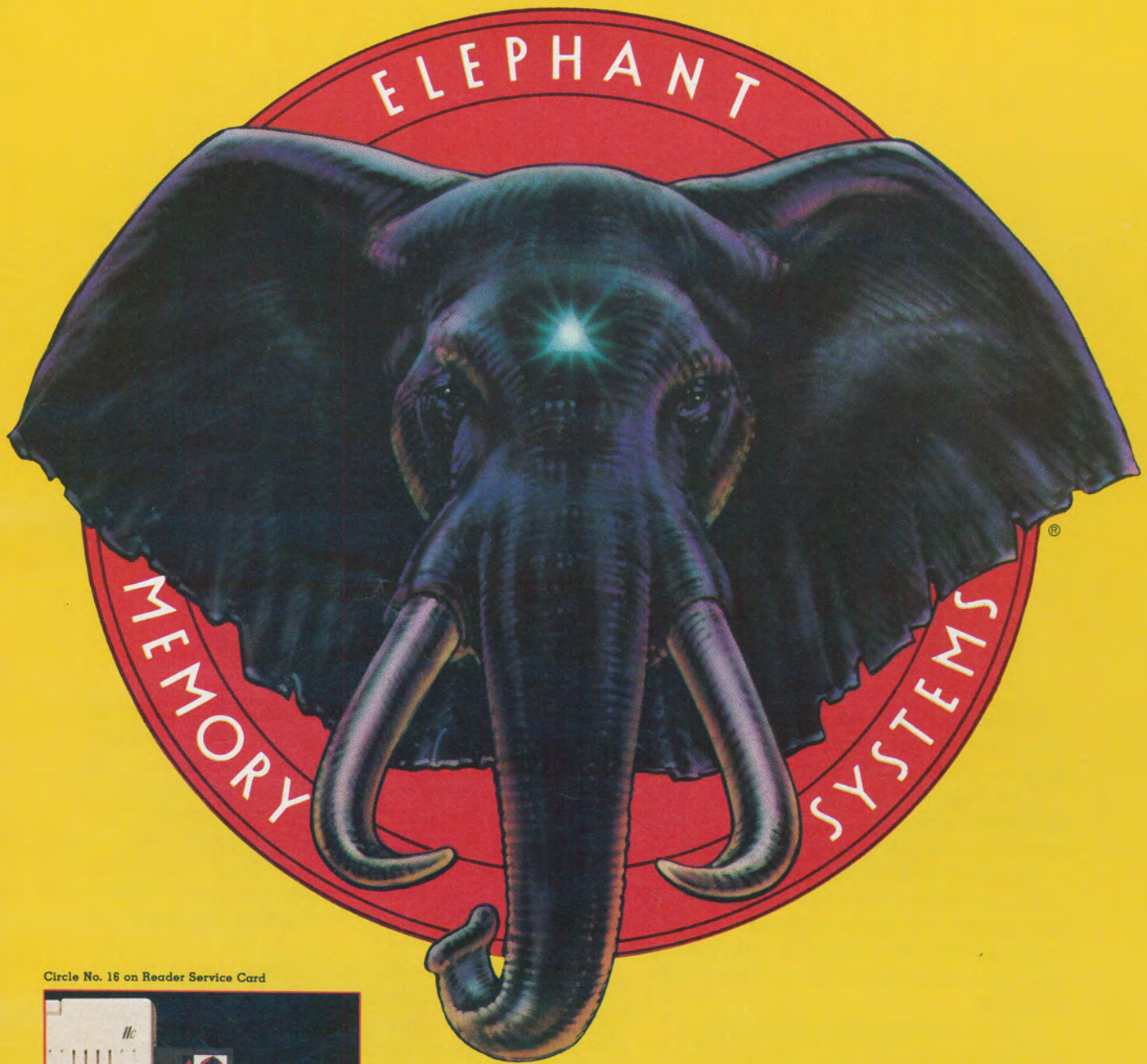

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